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# CONTENTS


Clinic of Dr. John Hunter Woolsey, *University of California Hospital* [illegible]
Traumatic Rupture of Bladder 333
Arterial Pressure 341

Clinic of Dr. Alfred Baker Spalding, *Stanford University Hospital*
Endocrinology of the Cervix with Case Report 361

Clinic of Dr. Howard C. Naffziger, *From the Division of Neurological Surgery, Department of Surgery, University of California Hospital*
Spinal Cord Tumors (Arachnoid Fibroblastoma) 383

Clinic of Dr. John F. Clarke, *Stanford University Hospital*
Extremities with Case Report 401

Clinic of Dr. Thomas W. Huntington, *University of California Hospital*
The Arterial Treatment of Carbuncle 419

Clinic of Dr. Leonard W. Ely, *Stanford University Hospital*
Chronic Arthritis of the Knee 431

Clinic of Dr. Alexander Weider, *Children's Hospital, Department of Surgery, University of California*
Congenital Pyloric Stenosis 437
Medical Differentiation 449

Clinic of Dr. Edwin L. Bartlett, *University of California Hospital*
A Tumor of the Scapula 44
A Rare Case of the Humerus 458
A Case of Chronic Duodenal Ulcer 463

Clinic of Dr. [illegible] K. Gilmore, *Stanford University Hospital*
Some Surgical Complications of Arthritis 468

Clinic of Dr. Harold Brunn, *Department of Surgery University of California, San Francisco Hospital Service*
The Surgical Treatment of Cancer at the Rectosigmoid Junction 473

Clinic of Dr. Wallace L. Terry *University of California Hospital*
Intramural Goiter 489

Clinic of Dr. Ernest W. Cleary *[illegible] Hospital*
Restoration of Function After Total Injuries of the Extremities 497

Clinic of Dr. Alexis R. Kilgore, *University of California Hospital*
Pulmonary Wounds and Self-Sutures 521
A Better Plan of Approach for Femoral Hernia 525
Index and Cover 539

Clinic of Dr. Benjamin Paque, *University of California Hospital*
Cholecystenterostomy 511

Clinic of Dr. Leo Eloesser *San Francisco Hospital*
Leg Ulcer 557

Clinic of Dr. Frank W. Lynch *University of California Hospital*
Etiology and Relation of Psoriasis 561
Cerebro-Spinal Fever and its Treatment 577

# THE SURGICAL CLINICS OF NORTH AMERICA

Volume 2 Number 2


## CLINIC OF DR. JOHN HOMER WOOLSEY

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## TRAUMATIC FRACTURE OF MANDIBLE

*Preoperative Preparation Type of Bone-graft Adaptation of* Bone-graft.

THIS patient is a male, twenty five years old, who one year ago accidentally had the "family shotgun" go off in such a manner as to open up the right side of his face blow out a portion of the right side of his mandible and expose the buccal cavity He was given first aid by the local physician, who closed the wound as well as possible after a débridement.

Following the accident for a period of three months there was a discharge, at first purulent and later a thin yellow from a sinus at the center of the scar There have been no pieces of metal or bone pass out since the initial closure. The separated portions of the mandible have never been immobilized. He entered with the request that the fractured jaw be repaired

*Physical Examination.*—A male well nourished ambulatory who was essentially negative except for the surgical condition.

Surgical Condition.—There was a loss of contour over the right side of the mandible, with a vertical retracted scar 6 x 2 cm. running from the right corner of the mouth down over the right submaxillary region. The scar and contiguous tissue were quite hyperemic and over the center of the scar were some yellow crusts (dried pus). The patient had no voluntary control of the depressors of the right angle of the mouth. The remaining portion of the right side of the mandible was tipped

so as to lie obliquely was drawn in to the midline and held so by the dense scar with the result that the teeth missed occlusion with the corresponding upper teeth by 1 cm. The right portion of the mandible moved separately from that of the left side. There was a dense scar over the site of the gunshot wound and a loss of 1.5 cm. of bone. The scar was somewhat spider

Fig. 146.—Preoperative and one and half months after the accident

like, depressed the right anterior angle of the tongue, had strands running to the fractured ends of the jaw and contained a few palpable pieces of indurated areas (metal) close to the mucous membrane side.

There were no signs of active inflammation, so the patient

was advised to see a dentist and have his teeth cleaned and prepared for immobilization of the lower jaw in view of an operation.

A bone-graft from the tibia to the mandible was attempted but eventually had to be removed on account of a necrosis due to the undermining at the center of the scar and an infection. Bone-grafts have been known to be successful in some instances of infection, but in this it was too severe. The lack of success

Fig. 147.—Roentgenogram showing defect in the mandible.

was attributed to two factors: first, lack of proper nourishment for the overlying scar tissue, since at the time of the operation it was not yet fully adapted to the area; and, second, micro-organisms were undoubtedly lying dormant in the tissues.

The above causes are commonly met with in plastic surgery and must be eradicated to insure success. Micro-organisms have been known to live for many months in such tissue. One should always wait for a period of three to four months in an

infected area before attempting any bone-grafting or the like. He should be certain of no active inflammation, and if there is any doubt, should carry out procedures to eliminate it.

Therefore the patient was sent home For seven months he has been carrying out light massage to the area local applications of moist heat to the tissues twice daily and forced motion outward to the right mandible so as to bring the lower and upper teeth in proper occlusion.

Five months ago under local anesthesia (1 per cent. novocain) the vertical scar was excised and the normal tissue approximated so that a linear scar 6 x 0.25 cm. in its widest extent remained. Today we observe that the tissues are in as normal condition as those of other parts of the body The scar is quite mobile it has no redness and no tenderness. The patient is able by the force of his tongue to hold the remaining portion of the right mandible out so that the upper and lower teeth appose Dr F V Simonton, of the University of California Dental School by bands on the teeth with interlocking pins immobilized the two portions of the mandible in proper apposition.

Operation.—A curved incision, convexity downward, is made from the right parotid region down t the level of the hyoid and up to a point 1.5 cm. on the opposite side of the symphysis menti. This is employed so as to insure an excellent covering of soft tissue immediately over the bone-graft and thereby not allow a direct connection between the graft and the surface. Should there be any infection of the wound, involvement f the graft is less likely to occur The fractured ends of the mandible are exposed and rongeured back to where viable bleeding bone is met. Likewise on the outer surface of each fragment for distance of 1½ cm. the periosteum is removed and the bone freshened to where it bleeds freely Now that the bed for the graft is prepared and one hole drilled through each end of the mandible the bone-graft will be obtained.

In an instance where there has been no loss of bone one can employ rib for stabilization purposes. In this case the area of destroyed bone is too great and we know as pointed

out by Eloesser [1] that such a graft is too fragile. Grafts from the tibia, obtained with one of the electrically driven motor saws, as described by Albee[2] and Phemister have been employed successfully Yet we know that the bone with which we graft should be as near like the original bone as possible should possess a slight curve in order to conform to the contour of the

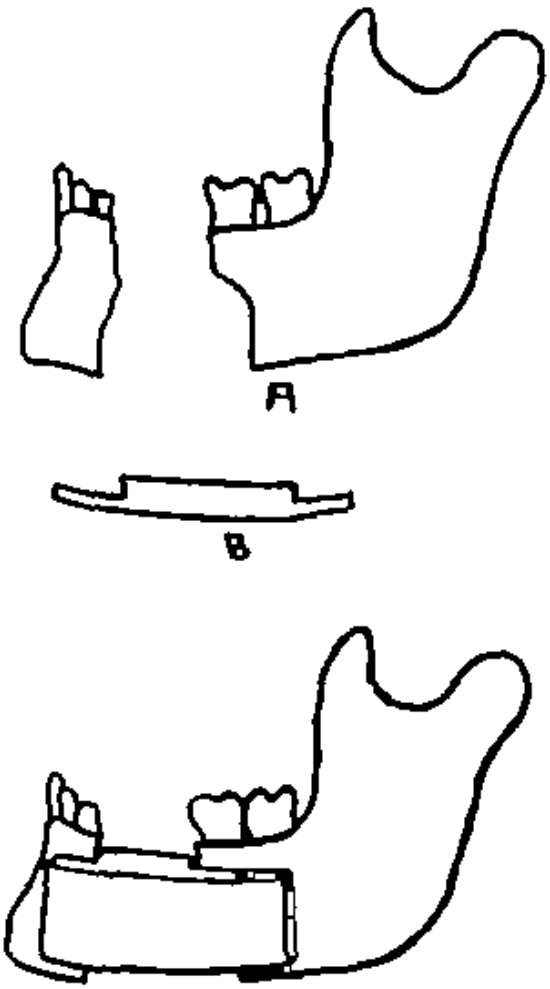


Fig 148.—*A* Defect in the mandible. *B* Bone-graft as fashioned. *C*, Bone-graft as it repaired the defect in the mandible.

jaw should be easily obtainable and preferably incapacitate the patient the least. Bone-grafts from the ilium as employed by Chubb have undoubtedly met best the above requirements.

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Bone-grafts from the ilium simulate more closely in character the bone found in the jaw They are obtained easily with a chisel, osteotome and hammer and can be fashioned with the same Should one need to replace the symphysis menti, he can obtain a bone-graft of excellent contour from the anterior superior iliac spine. It is not necessary to take more than one-half the depth of the ilium. Should the fascia and muscle attachments be necessarily disturbed, they can easily be replaced. The patient may be allowed around on a crutch within

Fig 149.—Roentgenogram showing bone-graft in the defect of the mandible

a few days after operation, and eventually back to his work more quickly than by any other method.

Therefore by a curved incision for reasons simila to those previously mentioned, the external crest of the right ilium is exposed. The origin of the fascia lata is separated. With the chisel, osteotome, and mallet the graft, ½ cm. in thickness, with the periosteum attached and cancellous bone on the inner side is obtained. The graft is now fashioned by use of the chisel so that it will fit in between the ends of the mandible and along

the outer side as well. This, as you observe gives added strength to the immediate fixation and, what is needed especially in bone work on the jaw greater surface for eventual bony union. Holes are drilled through each end of the graft so as to correspond to the holes previously drilled through the ends of the mandible.

The graft is now put into position and held so by a kangaroo tendon (heavy) ligature through the drilled holes and around the lower margin of the mandible. The wound is closed in three

Figs 150, 151.—Fifteen days postoperatively

layers—the deeper muscle and tissue, the platysma and the skin, respectively A dry dressing and Barton bandage complete the operation.

The wound over the ilium is easily closed the origin of the fascia lata being resutured to the inner crest of the ilium

The patient will be allowed to assume the most comfortable position and in three days will be about on crutches. The function of the bone-graft will be judged by its clinical appearance and by monthly x rays.

**Postoperative Convalescence.**—The patient was about on

crutches on the third day left the hospital on the sixteenth day and was walking normally on the twenty-second day assisting in his duties as a rancher

The jaw was released for one half hour at the end of one month and finally released from all immobilization at the end of two months, when there was bony union clinically

The important points illustrated by this case are the need of eradication of infection and improvement of circulation in scar tissue accomplished by physiotherapy location of the best type of bone with the desired contour for grafting a large defect in the jaw ease of obtaining the graft the least incapacitation of the patient and the increased area for bony union on the sides of the mandible which means, in turn, added strength.

## ANTHRAX PUSTULE

Diagnosis Treatment. Value of Antianthrax Serum.

THIS patient, who is a male aged forty-six, of Spanish descent, and employed as a ranch hand and butcher entered the hospital with the complaint of an infection of the left fore arm, with pain and swelling

Family History —Negative

Past History —Rancher and butcher ever since boyhood. No history of any previous similar illness. Venereal denied. Average weight, 240 pounds

Present Illness.—Five days ago the patient skinned a diseased cow and lifted the hide into a wagon in such a manner as to have it come in contact with his bared forearms. The following day he noticed a slight itching sensation upon the flexor surface of his forearm and scratched it through his under wear That evening he noticed a 'boil on his left forearm and put some tincture of iodin upon it and about it. Three days ago it became quite painful and the arm was slightly swollen, so he rubbed on some spirits of turpentine morning and evening He observed that several small blisters had appeared close to the "head of the boil. The latter he had punctured, with the liberation of a straw-colored fluid. Two days ago he consulted a local physician, who took a culture and dressed the arm first with ichthyol ung 10 per cent. and on the following day with chloroxone." The patient at the time of entrance complained of a very severe swelling of the left upper extremity a dull aching non-radiating pain localized to the entire arm, and a marked feeling of lassitude and general weakness.

Gastro-Intestinal System.—Anorexia. Nauseated but has not vomited. Bowels normal. General weight, 270 pounds.

Circulatory and Respiratory Systems.—Negative.

Genito-urinary System.—Nycturia II.

Physical Examination.—Shows an immense male with an expression of marked fatigue, a pulse of 112 but otherwise negative except for the surgical condition

Surgical Condition.—The left arm is swollen throughout its entire extent to twice the normal, with a tense, non-pitable

Fig. 152.—Patient sixteen days after lethal injection, nine day after last antistreptococcic serum. Edema of left hand and arm still present.

edema. This edema extends over the shoulder and chest so as to involve the scapular clavicular and left breast areas. In the lower third of the arm proper and the upper two-thirds of the forearm more marked on the flexor surface are many

unruptured and ruptured vesicles and bullæ containing clear yellow fluid. On the flexor surface of the forearm in its upper

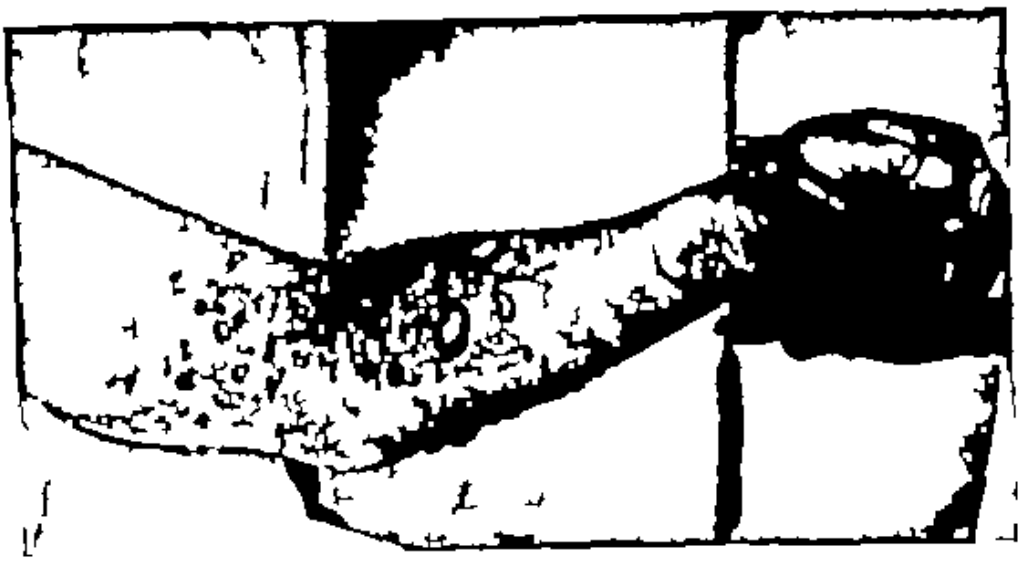

Fig. 153.—Anthrax pustule and chemical dermatitis, fifth day of disease.

third, over an area 8 cm. in diameter the skin is deeply hyperemic and the bullæ contain a serosanguineous material. There

Fig. 154.—Edema from anthrax pustule, fifth day of disease, and chemical dermatitis

is an area 5 cm. in diameter within the hyperemic area, where there is a definite gangrene of the skin. There are no special lines of lymphangitis and only a few medium-sized non-tender

lymph-glands in the axilla are observed The more deeply hyperemic portion of the forearm in the upper third on the flexo surface is tender to deep palpation and is the site where the initial lesion originated.

Pulse 112 temperature 38.2° C. and respirations 18.

Laboratory.—White blood-cells, 14,600 with polymorphonuclears 76 per cent. small mononuclears 13 per cent. large mononuclears and transitionals 9 per cent. and myelocytes 2 per cent.

Two blood-cultures on the fourth and fifth days of the disease, respectively were taken, and proved to be negative after five days of incubation.

The primary requisite before treatment can properly be given is to establish a correct diagnosis. The differential diagnosis lies between a furuncle with skin irritation from local application of drugs and a venous thrombophlebitis, a diffuse cellulitis, erysipelas, an anaërobic infection, and an anthrax infection.

Diagnosis.—A furuncle with some skin irritation from use of local drugs is a likely possibility for the vesicles and bullæ are localized to where the iodin and turpentine, and later *mercuric bichlorid*, have been applied. The central area does not show the characteristic oval swelling the tenseness or as severe tenderness as would be expected neither is there any sign of creamy pus that one finds t this stage On the contrary the area shows a slight gangrene t the center no pus, but a yellow fluid discharge an elevation unchanged from the contour of the entire arm, too extensive unless further complications, as a thrombophlebitis might have ensued. The latter is eliminated by the lack f tenderness along the course of the vein and the absence of any chills or sweats. It is not a localized streptococcus infection for obvious reasons The extensive edema without tenderness the absence f any localized area of pus and the lack of involvement of lymph-nodes are against cellulitis. An anaerobic infection as Vibrio septique

U fortunately the patient maintained no iodin had been used on the arm, so bichlorid of mercury bath as employed for few hours.

Bacillus edematiens or Bacillus welchii, occurs in deep wounds where there is muscle present—not subcutaneously as in this instance—and with an edema of this degree would show signs of gas in the tissues a greater degree of toxicity and would have involved only the forearm group of muscles primarily

The patient's occupation and the history of his skinning a diseased cow suggest the possibility of some unusual infection, such as anthrax. In order definitely to establish such a diagnosis the micro-organism must be demonstrated. Therefore a smear was taken from the content of one of the deeper colored bullæ. With a methylene blue stain single rods and short chains of square-ended and concave-ended rods (an appearance similar to a jointed bamboo rod) were observed. A Gram stain demonstrated they were Gram positive No spores were seen, but this was not to be expected since anthrax does not form spores in the human body Fortunately the referring physician made an agar culture forty-eight hours before and so we made a smear from this. Again chains of large square ended bacilli were seen, and in the center of many of the bacilli were oval spores similar in size to the width of the bacillus itself The above corresponded to the description of the anthrax bacillus and its spore formation as originally described by Robert Koch in 1876

Treatment.—Until 1920 the medical literature advised all forms of treatment—sustaining the patient's general condition without local treatment radical excision and cauterization excision with cautery injection of carbolic acid employment of normal beef-serum and more recently the employment of antianthrax serum has been urged. It is unfortunate that one is led into such a dilemma, for the several methods do not give equally good results. However a study of the pathology aids in deciding the rationale of treatment.

The organisms are found in the deeper layers of the skin just at the level and around the subpapillary vascular net in the lymph-channels and in the immediate local capillaries which they mechanically block. About them and in the subjacent cellular tissue is a wall of leukocytes. There are few to no

leukocytes among the micro-organisms, and as a result a characteristic thin yellow discharge is observed in contrast to the thick pus of a staphylococcus infection.

Incision as in a furuncle would then be obviously out of order for it would only open new areas into which the infection could spread. Excision unless in the first twelve to twenty four hours—and the infection is not recognized as anthrax at that early hour as a rule—is open to the same criticism, since one cannot tell the distance to which the organisms have invaded. Hiss and Zinsser[1] were unable to prevent the spread of the infection in guinea-pigs by immediate excision. Scholl[2] cites definite cases where the infection spread coincident with surgical measures.

Excision with cautery is open to criticism for its mutilating effect, the indefiniteness of getting around the infection, and the sealing of all pores of exit for the serum and lymph in washing out the toxins and broken-down material from leukocytic reaction and bacteriolysis. Regan[3] observes that anthrax is a local condition primarily in man, and any of these measures that tend to generalize the infection are entirely wrong since in many instances they lead to septicemia. Injection with carbolic acid is unscientific, since one must act blindly and is most likely to destroy the protective ring the body has built. The employment of local applications of all types of antiseptics, of powdered ipecac, extract of Bacillus pyocyaneus and what not has their respective advocates, but it is doubtful if they are as effective as reported.

Kraus Penna, and Cuenca have employed normal beef serum locally and intravenously with most favorable results. The explanation of this is as yet not understood unless perhaps the cattle have already an established racial immunity. Kolmer experimentally did not find that normal beef-serum possesses protective and curative value although it has some antibactericidal properties.

Antianthrax serum has been known ever since 1895 when Marchoux, of France and Sclavo of Italy independently reported their investigations. It has been used prophylactically

and therapeutically in cases for some time, and of late quite extensively in human infection in Italy England, and Argentina. Since 1918 the antianthrax serum has been employed in this country and most encouraging reports are made. Cases in a septicemic state and regarded as hopeless by other treatments have been cured with the serum. The percentage of cures with this method is unanimously higher than that from other treatments. The report by Hubbard and Jacobson, of the New York Health Department, is especially illustrative.

| | Number of cases | Recoveries | Deaths |
|---|---|---|---|
| Antianthrax serum only | 14 | 12 | 2 |
| Antianthrax serum and incision | 5 | 4 | 1 |
| Antianthrax serum and excision | 4 | 3 | 1 |
| Antianthrax serum and chemical cautery | 2 | 0 | 2 |
| Chemical cauterization and incision | 2 | 1 | 1 |
| Antianthrax serum, excision, chemical applications | 1 | 1 | 0 |
| Chemical application | 1 | 1 | 0 |
| Chemical application, yeast | 1 | 1 | 0 |
| No treatment recorded | 4 | 0 | 4 |

Is it logical to employ an antianthrax serum? No true exo- or endotoxins have ever been demonstrated, yet Kolmer[7] notes "local lesions develop so rapidly and become so quickly ulcerative as to suggest very strongly the action of some local toxic substance. Vaughan[8] has shown that anthrax protein possesses toxic qualities and it may be that the bacteremia produces an accumulation of toxins. Clinically excellent results have been obtained when the antianthrax serum was employed properly Yet in the majority of instances too small a dose (20–30 c.c.) and lack of subsequent doses and too late administration in the course of the disease have defeated the value of this form of treatment. A large amount (80–200 c.c.) should logically be employed, and the method of choice should always be the intravenous administration. The effect of the serum and the additional administration should be judged by the patient's temperature curve pulse-rate and general condition.

In the case presented the following course of treatment, as advised by Dr Karl F Meyer of the Hooper Research Foundation, was employed. After desensitizing the patient* (1)

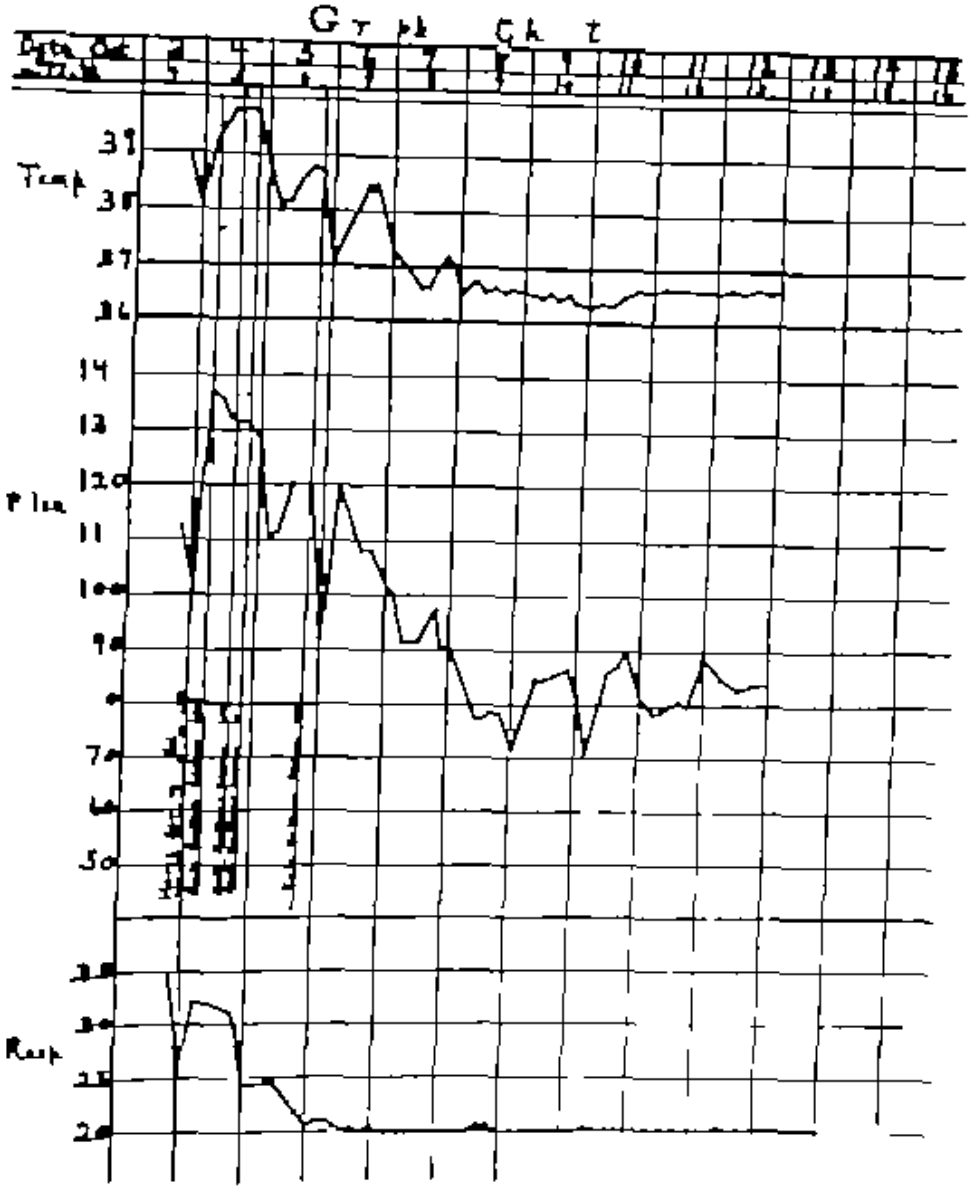

Fig 155.—Anthrax pustule infection of left arm with graphic chart showing reaction of pulse, temperature, and respiration with antianthrax serum treatment

150 c.c. of Cutters antianthrax serum was given intravenously at 7.00 A. M. This was followed by no apparent improvement

*One minim of horse-serum intracutaneously to determine degree of sensitization; one hour later 1 c.c. subcutaneously; and one hour later 1 intramuscularly without any untoward reaction

in the temperature curve a slight drop in the pulse-rate and no improvement in the patient's general condition. (2) At 4.00 P M (nine hours later) 100 c.c. were given intravenously followed by 150 c.c. of 2.5 per cent. soda bicarbonate solution, with no apparent improvement. (3) At 8.00 P M (four hours later) another 100 c.c. of serum were given intravenously followed by 75 c.c. of 2.5 per cent. soda bicarbonate solution. Coincidentally with this the temperature fell to 38.2° C., the pulse rate decreased 20 points (to 112) the respiration fell 7 points (to 24) and the patient showed a moderate improvement. His temperature again rose the following afternoon to 38.8° C.

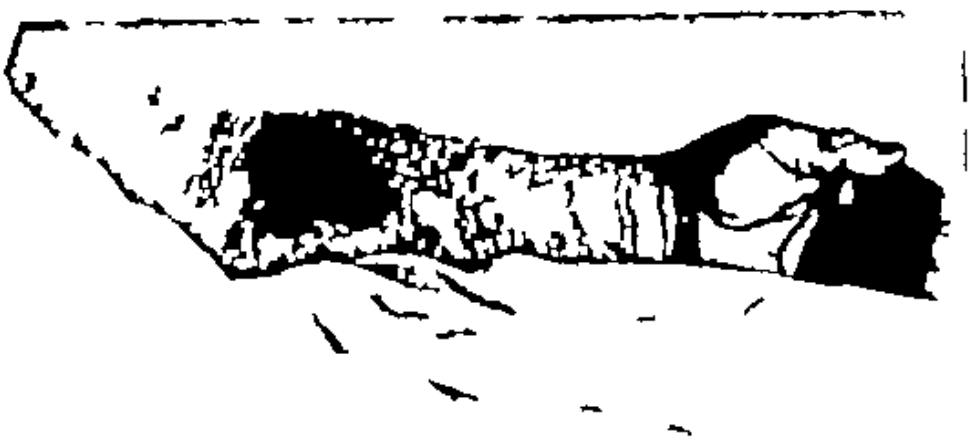

Fig. 156.—Anthrax pustule case showing gangrenous area of skin.

the pulse remaining at 120 and he did not feel so well so at 6.00 P M (twenty two hours later) he was given 150 c.c. of serum intravenously with a coincident drop in the temperature to 37.2° C. pulse 92 respiration 20 a marked improvement in the general condition and a noticeable decrease in the edema. His clinical course from this point on was characterized by a gradual decrease in the edema until thirteen days after the last serum treatment, when it had practically disappeared, and the occurrence of a gangrene of the skin, 8 x 6 cm at the site of the original lesion. The latter was eventually skin-grafted.

The local lesion was treated with boric ointment since the skin was so evidently irritated and because the local area was

so apparently large as to render it most inadvisable to employ surgery

Local therapy with antianthrax serum was obviously impossible in this case. It is employed however with the injection of 2 to 3 c.c. into the base of the lesion every twenty-four hours. This has never resulted in any apparent harm, has clinically been of benefit, and has theoretically seemed to be of greater value than all other forms of local treatment, since it reaches directly the original source of the infection.

Therefore the conduct of a case of anthrax pustule should be as follows

*Diagnosis:*

1. History of probable exposure.
2. Lesion—non-purulent, center gangrene, marginal vesicles, surrounding edema.
3. Typical organism from pustule or (in first thirty-six hours only) from vesicle
4. Spores from cultures

*Treatment:*

1. General supportive.
2. Antianthrax serum (2 to 3 ) locally every twenty-four hours
3. Antianthrax serum in large doses (80 to 200 c.c.) intravenously observing the pulse and temperature curves and the general condition as guide.
4. No surgical treatment.

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## CLINIC OF DR. ALFRED BAKER SPALDING

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# TUBERCULOSIS OF THE CERVIX WITH CASE REPORT

IN 1886 Hegar[1] called attention to the fact that tuberculosis of the female genital organs was not so rare as had been previously considered at that time. This observation has since been abundantly substantiated by different observers in various parts of the world for wherever a routine microscopic examination of gynecologic specimens removed by operation has been systematically carried out it has been demonstrated that tuberculosis of the genital tract is a fairly common finding

Greenberg in a recent publication on tuberculous salpingitis, based on a clinical study of the records of 200 patients suffering with genital tuberculosis estimates that nearly 1 per cent. of all surgical gynecology shows tuberculosis of some part of the genital tract and that from 5 to 10 per cent. of all fallopian tubes removed because of inflammatory conditions appear microscopically to be tuberculous

As long ago as 1894 Williams, in his monograph on tuberculosis of the female genital organs stated that one operation in twelve for inflammatory disease of the pelvic organs had been found upon microscopic study to be tuberculous, although in 75 per cent. of the patients the tuberculosis was not suspected until the laboratory examination had been made.

From the experience of Martin, Kroenig Schmorl, Pankow and others about 2 per cent. of all pelvic pathology has tuberculosis as its base.

Estimating the incidence of genital tuberculosis from another point of view Murphy[4] states that 53 cases of genital tubercu-

From the Division of Obstetrics and Gynecology Stanford University School of Medicine.

losis were found in a series of 4470 routine autopsies performed by Schraumn von Winckel and Donhoff which gives an incidence of 1 case of genital tuberculosis in 84 autopsies, while in 270 autopsies on tuberculous women, 24 cases of tuberculosis of the genital organs were found, or an incidence of 1 case of genital tuberculosis in 11 patients with general tuberculosis.

While the most common site of genital tuberculosis seems to be the fallopian tubes, the uterus is also frequently affected, although it is quite rare for the infection to descend below the internal os. It is generally admitted that tuberculosis limited to the cervix is a rare pathologic condition.

Greenberg in his study of 200 cases of tuberculous salpingitis, found only 7 cases of tuberculosis of the cervix, or 3½ per cent., and states that Labhardt, in a study of 73 cases of genital tuberculosis, did not find the cervix involved in any. Eden and Lockyear in their Text-book on Gynecology state that 8 per cent. of genital tuberculosis involves the cervix. Norris found in 66 tuberculous specimens of the female genital organs only 1 case of tuberculosis of the cervix.

When one studies the literature for case reports of tuberculosis limited to the cervix, it is surprising to find such a small number of cases reported. For instance, in 1908 Vineberg[4] could find only 22 cases of tuberculosis limited to the cervix, and of this number only 4 met the requirements of Amann, who stated that to prove tuberculosis primary in the cervix it was necessary that the woman be autopsied and that no tuberculosis be found in any other part of her body. Of course such a requirement is out of the question for all of those patients who recover or for those who unfortunately die some are not submitted to autopsy examination.

It is probable that about 135 cases of tuberculosis limited to the cervix have been reported in the literature but of this number many reports would have to be eliminated because no laboratory examination had been made of the pelvic organs except the cervix, and many diagnoses have been based upon clinical findings.

In the Women's Clinic of Stanford University School of

Medicine it has been our routine to examine histologically every placenta and every specimen removed at operation since the clinic started in 1912 To date 6005 specimens have been examined about one half of which are from gynecologic operations Of this number the cervix has been examined 704 times, and only once has the diagnosis of tuberculosis of the cervix been made, although there are in the laboratory a number of specimens showing tuberculosis of the uterus above the internal os.

Considerable discussion has taken place regarding the method of tuberculous infection of the cervix. Some doubt exists as to the possibility of infecting the healthy cervix by instruments fingers, or other direct means while it is known that many men suffering with genital tuberculosis of the testicles do not infect the pelvic organs of their wives. Moreover is has been observed that tubercle bacilli may be obtained from the secretions of the cervix without there being any local infection of the cervix, the tubercular germs being passed downward from an infection of the tubes. Nearly all cases of genital tuberculosis seem to have a tuberculous origin in some other part of the body the tubercle bacilli being transported to the cervix by way of the blood-stream. It is possible that in some cases the cervix is infected by direct continuity with a tuberculous endometritis, although pathologic findings seem to point to the fact that tuberculous endometritis is usually limited to the internal os.

The symptoms of tuberculosis of the cervix may be very few in number and the general health of the patient may be so good that she may suffer with the condition for many years without consulting a physician. On the other hand it may be because of symptoms of pulmonary tuberculosis that she seeks medical aid. She may be the picture of good health, or may be emaciated with pyrexia, hemoptosis, anorexia, night-sweats, etc. due to the condition of general tuberculosis. She may complain of pain in the lower abdomen with menstrual irregularities due probably to either tuberculous peritonitis with tuberculous salpingitis, or tuberculosis of the endometrium.

With tuberculosis limited to the cervix the most usual symptom is leukorrhea with occasional blood-stained discharge. These symptoms are particularly suggestive in a young individual. On examination, the picture seen with the speculum depends upon the variety of the tuberculous process, which probably means the state of development of the tuberculous infection.

In different parts of the cervix many varieties of tuberculosis may be found. There may be ectropion with hypertrophy of the cervix, or the cervix glands may be cystic, at times reaching the size of a cherry which may contain sebaceous material like in a dermoid but the usual finding is some variety of a tuberculous ulcer The ulcer may be papillary resembling the cauliflower form of carcinoma of the cervix or the ulcer may be well defined with undermined edges, surrounded by normal tissue or surrounded by typical tubercles. These ulcers are usually covered with gray exudate which, on being wiped away show a yellow base. The vaginal portion of the cervix may be studded with tubercles or the tubercles may be localized to the superficial epithelium of the glands, the glands being filled with masses containing tubercle bacilli. This variety has been named by Schutt "bacillary catarrh.

Beyea described four varieties of tuberculosis of the cervix. (1) ulcerative, (2) papillary (3) miliary and (4) interstitial, these varieties being in the frequency of incidence.

On palpating the tuberculous cervix the ulcer feels more like an erosion than like a carcinomatous ulcer and while some bleeding may follow the examination, it is not nearly so common an occurrence as that with carcinoma f the cervix.

To diagnose the tuberculous condition of the cervix from carcinoma, venereal lesions, or ther forms of ulcer of the cervix, resort must be had to the laboratory

Babbe[9] called attention to the fact that tubercle bacilli could be demonstrated in the discharges from the uterus or in the tissue removed for examination, as long ago as 1883 The usual experience is that the finding of tubercle bacilli in the discharges or in the tissue is many times not successful but

almost invariably the accepted picture of tuberculosis with the formation of epithelial tubercles and giant-cells may be found with ordinary histologic methods. Some pathologists deny the fact that this picture always means tuberculosis, and insist on the finding of the tubercle bacilli for accurate diagnosis.

The prognosis of tuberculosis of the cervix is always serious. The disease usually slowly progresses and no one has as yet observed a spontaneous healing of this condition, although Murphy[4] states that spontaneous cure is possible, though uncommon.

Sterility is found to be present in over 60 per cent. of the patients or if pregnancy occurs the puerperium may be complicated by an extension of the tuberculous process which may lead to the rapid death of the patient. Diagnostic curetage is dangerous, while New[28] states that he has seen cases rapidly progress following attempts to cure tuberculosis by injections Even cauterization of the tuberculous ulcer does not seem to cure the local lesion. He states that of 77 women under treatment for genital tuberculosis in the Medical Clinic in Berlin observed from 1902 to 1910 of 55 patients operated upon, 75 per cent. are still living, while of 22 patients treated conservatively 52 per cent. are still living, and because of the bad prognosis advises radical operations.

Beyea reports that in 10 cases treated by hysterectomy 3 patients died immediately after operation. Of the remaining 7 patients, 1 lived for four months and the other 6 patients were cured and remained well for many years.

In treating the patient the same general plan should be followed that has been found to be so successful with tuberculosis in other parts of the body not that fresh air and good food will succeed in curing tuberculosis of the cervix, but these measures tend to build up the resistance of the patient, so that better results may follow surgical interference

Attempts have been made to cure the lesion by various light rays, particularly the use of the Kromayer lamp or by use of the x ray Cauterization with chemicals or with the Paquelin cautery has been attempted, and while it may change

With tuberculosis limited to the cervix the most usual symptom is leukorrhea with occasional blood-stained discharge. These symptoms are particularly suggestive in a young individual. On examination, the picture seen with the speculum depends upon the variety of the tuberculous process, which probably means the state of development of the tuberculous infection.

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cast, with some increase in the number of leukocytes and repeated findings of red blood-cells.

Examination of the blood gave 80 per cent. hemoglobin with 9000 white cells, 65 per cent. polymorphonuclear and 34 per cent. lymphocytes. Wassermann examination was negative.

Vaginal examination The vulva and glands of Bartholin and Skene were negative. The cervix was raw and bleeding There was a very granular papillary growth on the cervix, involving the vaginal wall posteriorly This ulcer bled readily

Fig. 157.—Section from the cervix showing tubercle with giant-cell.

on sponging, but was not friable, and felt soft to palpation. The vault of the vagina was granular and soft. The fundus was in good position and the adnexæ were thought to be slightly thickened There was a marked odor to the vaginal discharge.

The impression from this preliminary examination was chronic cervicitis (questionable) or carcinoma of the cervix (questionable) and a piece of the ulcer was removed for microscopic examination

the course of the disease it is not curative. The generally accepted plan of treatment for tuberculosis of the cervix seems to be either a high amputation of the cervix or what is far better either a vaginal or abdominal panhysterectomy

Because of the rareness of this condition and because the patient was so long under observation and had submitted to various lines of treatment, including x ray with final cure following abdominal hysterectomy the following case report is made

## CASE REPORT

A young Italian woman, twenty three years of age who had never been pregnant registered in the Women s Clinic at Stanford University School of Medicine on March 15 1921 She could speak very little English, but the complaint seemed to be that she had had n pregnancies, although she had been married for nine months. There had been a scant white vaginal discharge fo seven years, and since marriage this had occa sionally been blood tinged. She denied previous illnesses.

Her menstrual flow began at fifteen was regular of the twenty-eight-day type lasting five days without pain. Bowels were regular there was no bladder frequency Husband was well and denied ever having had venereal disease

Physical examination was negative in regard to thyroid, heart and lungs. Blood-pressure 135 systolic, 84 diastolic. Abdominal examination was negative. In the left breast, be neath the nipple was a firm, round, freely movable not tender mass. Pressure on this mass was followed by some whitish fluid from the nipple.

x Ray examination of her chest showed evidence f pleural thickening between the lobes of the right lung The heart vessel shadow was displaced to the right, but was therwise normal. The lung fields were comparatively clear The hilus and bronchial tree shadows were within the normal limits. The conclusion was an old pleurisy on the right side but no x ray evidence of active disease in the chest.

Examination of the urine showed an occasional granular

into below the lowermost ulcer and the excision was carried posteriorly distal to the diseased area by sight. The vaginal vault was then approximated and suspended by the sacro-uterine, broad and round ligaments by means of a continuous purse string suture of chromic catgut. The raw surfaces were covered over Appendectomy was done in the usual manner by inverting the stump with one purse-string Pagenstacher suture. Closure Plain continuous catgut was used for the peritoneum fascia, and skin interrupted gut for the muscle and fat five silkworm stay sutures were used.

The patient remained in the hospital for fifteen days and made a normal recovery without wound infection. There was only one rise in temperature over 100° F which occurred on the morning following operation. The pulse rate varied between 80 and 100

The discharge examination on October 2, 1921 showed the vaginal mucosa to extend about 6 or 7 cm., beyond which a soft canal could be felt about one-third the diameter of the vagina, and about 2 or 3 cm. in extent. On palpation, a small amount of light yellow fluid came away Speculum examination showed the vaginal wall clear to about 7 cm. where the vault was open for a diameter of about 2½ cm. and the presenting tissue was slightly necrotic and invaginated for about 3 cm The chromic sutures were still in place. There was no odor noted. The patient was discharged with a request to return to the clinic.

The pathologic examination of the tissue removed in the operation was as follows 'Specimen consists of uterus which is 8 x 6 x 3 cm. The cervix is almost completely destroyed with the ragged ulcer having undermined edges A portion of the vagina attached to the cervix was 2 x 8 cm. and was ulcerated nearly to the inched edge. The right tube was 6 cm. long, closed, otherwise normal. The right ovary was normal 3 x 4½ x 1½ cm. (Fig. 158) The appendix was bent at the distal end and bound down by adhesions 9 cm. long

Microscopic examination showed Chronic appendicitis with no evidence of tuberculosis. There was fibrosis of the ovary

The microscopic examination of the ulcer on March 21 1921 showed marked adenomatous condition with plasma-cells in the stroma. There was typical epithelial tubercle formation, with giant-cells in the stroma. A diagnosis of granuloma of the cervix, probably tuberculous, was made (Fig 157)

Beginning March 24, 1921 a series of *x* ray treatments over the whole lower abdomen and pelvis anteriorly was carried out at intervals of every three weeks until August 23d. The *x* ray dosage was very small, consisting in 15 milliampere minutes, at 20 inches, 10-inch spark gap with 5 millimeters aluminum filter This treatment was associated with local treatment in the clinic with various antiseptics, but without the slightest signs of improvement.

On September 6 1921 the patient entered the hospital for operation. At that time the cervix presented a ragged, crater like ulcer on the left side and from this ulcer nodules continued down on the left wall of the vagina for about 1 inch. There was a profuse purulent discharge and the ulcer had a soft granular feeling and bled lightly on examination. There was a ring of granular vaginitis for about 1 inch below the cervix.

On September 16th the following operation was carried out The vagina was sterilized with 25 per cent. silver nitrat solution. Laparotomy was done by the usual midline incision below the umbilicus and carried well down to the symphysis. Exploration f the abdomen showed a large soft gall-bladder both kidneys were smaller than normal. The appendix was adherent to the right ovary by the tip This adhesion was freed and the right ovary was removed by clamping cutting, and tying the right broad and round ligaments and the vessels to the ovary and tube with chromic catgut. Clamps were then placed on the left tube broad and round ligaments at the uterine end, and these were freed from the fundus and the vessels ligated with chromic gut. A complete hysterectomy was then done by dissecting off the bladder fold and clamping, cutting and tying the uterine and vaginal vessels and the sacro-uterine ligaments. The anterior vaginal vault was opened

The vaginal discharge had entirely disappeared. The pelvic examination was negative except for an area of redness in the region of the scar in the vaginal vault. Several small pieces from this region were removed for microscopic examination This examination showed no tubercles or giant-cells. The vaginal epithelium was normal but underlying this normal epithelial layer was a thick layer of plasma cells and round cells. The evidence so far presented seems to show that the

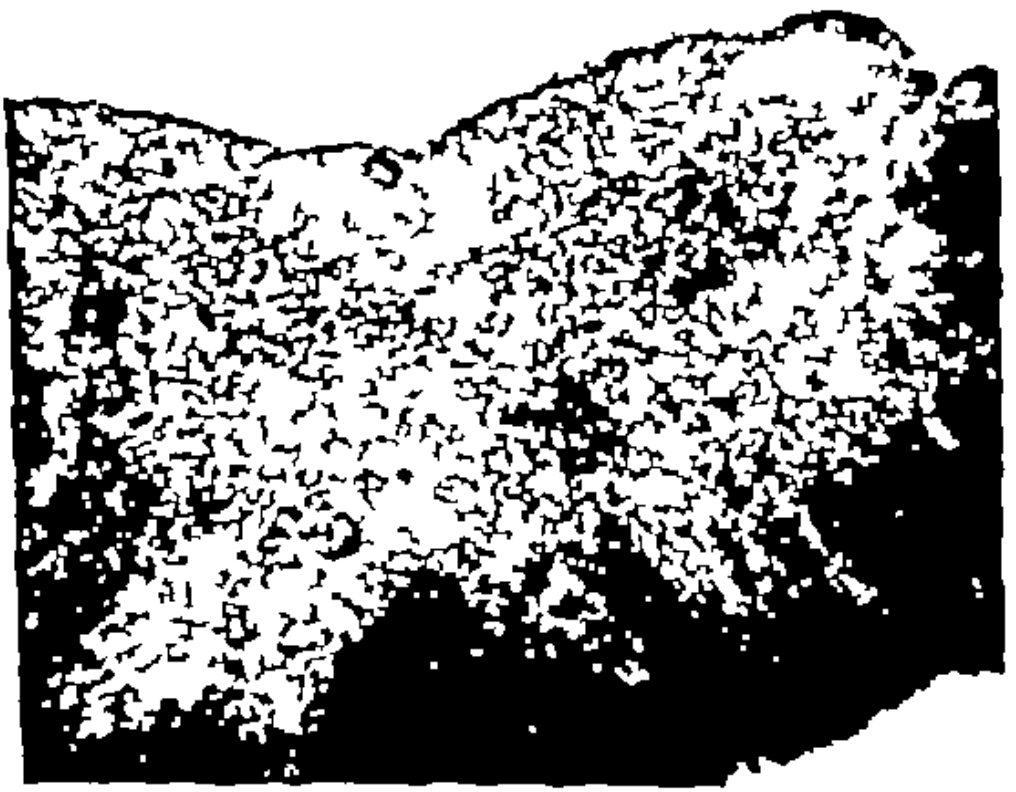

Fig 139.—Section of the vaginal wall showing tubercle formation, no giant cells.

patient is cured of her tuberculosis of the cervix, although there still remains some inflammatory reaction in the upper part of the vagina.

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with no signs of tuberculosis. The fallopian tube was normal. The endometrium was normal above the internal os. The wall of the uterus was normal. The cervix showed hyperplasia of the glands with extensive area of tubercle formation, showing epithelioid cells and many giant-cells. Section of the vaginal

Fig 158.—Specimen of the uterus, right tube, and ovary (fimbriated end of tube closed) uterus with cervix showing tuberculous ulcer; also section of vagina removed

wall gave the same picture of tuberculosis as shown in the cervix (Fig 159)

The patient returned to the Clinic on February 3 1921 stating that she had felt so much better that she did not see why the social service workers insisted upon her returning

## CLINIC OF DR. HOWARD C. NAFFZIGER

From the Division of Neurological Surgery Department of Surgery University of California Hospital

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# SPINAL CORD TUMORS (ARACHNOID FIBROBLASTOMATA)

From a series of spinal cord tumors this single group has been selected for study The designation most popularly applied to them is that of "endotheliomata, although they are frequently called fibromata. They represent one clinical and pathologic group which is particularly amenable to surgical treatment and of all types of spinal cord tumors probably give the most brilliant clinical results.

With all the attention that has been called to the surgery of spinal cord tumors the diagnosis of the condition is not usually made until the paralyses are far advanced and the patient has been through many hands. For each of the cases here presented there have been from four to twenty medical attendants before the diagnosis was made and treatment given. It would seem that the feeling that spinal cord tumors are very infrequent is largely responsible for this and also that syphilis is given undue prominence. The diagnosis of spinal cord compression is not difficult. A slowly oncoming paraplegia or quadriplegia with a constant upper level of sensory involvement usually tells the story regardless of the details of the involvement.

The degree of permanent damage to the spinal cord from compression depends chiefly upon the rate of its progress and the degree of compression. Sudden acute pressure upon the cord causes a measure of contusion not at all comparable to the result of a slow pressure over many months. In each the degree of compression may be the same.

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bone and are more or less cellular acquire a stroma and vascular supply from the invaded structures. It not infrequently happens that the fibrous character of the resulting new growth is such that it is impossible to distinguish the tumor cells proper from the stroma, except perhaps in the whorl formation. It must be admitted that the above explanation is often far from satisfactory in interpreting the microscopic pictures encountered.

"It is with a sense of relief, then, that one encounters the studies of Mallory (Jour Med. Research, 1919–20 v xli, p 349) who finds that the layer of flattened cells on the surface of the arachnoid are fibroblastic in character and possess fibroglial and collagen fibrils that there is no dural endothelium that the frequently encountered arachnoidal thickenings show a marked tendency to invade the dura, may include dural fibroblasts in their meshes and may show a tendency to whorl formation. The more complete details may be read in Mallory's article. In brief it is on this basis that such tumors arise and being from a tissue which always possesses fibroblastic qualities the resulting tumors have potentialities to and do actually form fibroglia collagen and elastic fibrils. They then should be classed as fibroblastomata, and out of respect to their various peculiarities the designation arachnoid fibroblastomata is suggested by Mallory This suggestion is adopted in the diagnosis above given.

Of these 6 cases the first 5 have been followed for periods ranging from two to ten years. The sixth case has not been under observation since leaving the hospital. The histories and repeated neurologic notes have been condensed and then abstracted to include only positive statements and findings.

CASE I

University of California Hospital, No 29,032

White woman, married housewife aged thirty-one years.

**Final Diagnosis.**—Spinal cord tumor—arachnoid psammofibroblastomata, level of eleventh or twelfth dorsal lamina.

**Complaint.**—Pain in back and hips with progressive paralysis of legs and impairment of bowel and bladder control.

The degree of permanent change in the cord from compression determines the amount of improvement after relief from the pressure. A rapidly growing hard bone tumor of the vertebral canal may be expected to produce different results from a slowly growing soft tumor in the same location.

In view of such factors a search of the literature on spinal cord tumors has been made, and it is to be noted that in the writings spinal cord tumors are usually reported in one group regardless of the type of tumor its rate of growth, or the degree of cord compression. From a consideration of all the types a common clinical picture has been built up as to the symptomatology of spinal cord tumor It seems true that prior to operation or to identification of the tumor a diagnosis of its type will always be difficult and frequently impossible. Still, in a consideration of symptomatology and very particularly in prognosis, the *rate* of growth and the *degree* of compression are important. These enable us in some measure t forecast the results of treatment. In the cases presented here these factors in varying degrees have been noted In all there have been marked paralyses and in most it has been extreme The after-course following relief of pressure has in some been beyond our expectations.

The proper classification of these tumors, all of which are of the same pathologic type has been a matter of some discussion. For study of all of them we are indebted to Dr Glanville \ Rusk, whose opinion has been expressed as follows

"The group of tumors here encountered arising presumably from the superficial cells of the arachnoid, in intimate association with the dura come under the designation of endotheliomata of the dura according to the nomenclature all but universally employed. This terminology predicates that the cells from which the tumor takes origin, *i e.* those lining the pposed surfaces of dura and arachnoid, ha e in their development taken on characters differentiating them from the subjacent connective tissues and so justifying their inclusion with end thelium. It is explained that the tumors which ma occur from this tissue and which invade the dura and t times the overlying

*x* Rays Slight curvature convex to left in region of the tenth or eleventh thoracic vertebra. Fifth lumbar vertebra partially sacralized on right side with joint between transverse processes and sacrum.

A second spinal puncture was reported Fluid clear Wassermann, 0.2 0.3 0.5 negative, with two antigens. Protein normal Globulin 0 cell count 6 Gold chlorid, 0043321000 Luetic curve (?)

Neurologic Examination.—Cranial nerves negative No abnormalities above middle of trunk.

Spine No deformities apparent. No fault in mobility Occasional variable tenderness at about the tenth dorsal spine.

Motor The patient is bedridden from lack of power and of control of lower extremities. Spasticity is marked in both legs but greater on the left.

*Abdomen* —When lying and attempting to sit the umbilicus moves to the left. This is constant, and corresponds with the lessened contraction of the abdominal muscles on the right as shown by palpation. The movement is directly lateralward. No up or down movement. The left side of the thorax also moves more on the right.

*Lower extremities*

| *Right* | *Left* |
|---|---|
| Hips Weak voluntary flexion. | Flexion entirely lost. |
| Extension weak, | Extension very weak. |
| Internal rotation moderately strong. | Internal rotation lost. |
| External rotation lost. | External rotation lost. |
| Abduction strong | Abduction } Very weak, almost lost. |
| Adduction weak. | Adduction } |
| Knees Quadriceps fully extends the knee | Quadriceps extends the knee, but much weaker |
| Hamstrings—internal and external strong | On palpation are felt to contract, but their power is negligible. |
| Ankles and toes All muscles supplied by the internal popliteal nerve act, but are weak. | All muscles supplied by the internal popliteal nerve act, but are very feeble. |
| All muscles supplied by the external popliteal nerve act, but are weak. | All muscles supplied by the external popliteal nerve act, but are very feeble |

Abstract of History.—One brother had tuberculosis. Some contact with patient. Patient has dyspnea upon moderate exertion. Apart from some acute attacks of pain in the right lower quadrant of the abdomen, with interval digestive disturbances, there is nothing else of note up to the present illness.

Present Neurologic Trouble.—The patient connects some occurrences ten years ago with her present trouble. During a pregnancy at that time she had formication over the sacral region more on the left side. From that time on this trouble progressed and was worse during menstruation. No other symptoms up to four months ago when she was awakened at night with severe pain in the left side of her back in the low lumbar region. This pain was severe and gradually radiated to hip and around the abdomen. The pain was intense and not relieved by hypodermics. Later it moderated but some pain persisted, with occasional severe paroxysms. The pain was worse on reclining or sitting and relieved by standing or walking. While this pain was still present there came a feeling of numbness in the right foot. Two days later it shifted to the left knee and progressed downward to the left foot. It has persisted since then, and with it a feeling as if the leg were in a tight cast. Difficulty in control of the leg next appeared. She stumbled and felt as if walking on rubber balls. The left foot turns inward and the toes upward. Sensation in the rectum became gradually impaired. Next difficulty in voiding particularly in initiating urination appeared. Following a spinal puncture all of her symptoms became definitely worse and control of the right leg was difficult. Upon entry the patient was bedridden—unable to walk.

Examination.—General physical examination revealed systolic heart murmur without other cardiac findings. Some tenderness in the right lower quadrant of the abdomen. Nothing else of note. Blood-pressure 118/74. Urine negative. Blood count, no abnormalities. Spinal fluid clear—2 cells. Fehling's reduced. Nonne + 1. Noguchi, + 2. Wassermann negative. Colloidal gold 0013554100. Blood Wassermann negative.

seen numerous white plaques varying in size from 1 or 2 mm. in diameter to nearly 1 cm. There were perhaps twenty five in

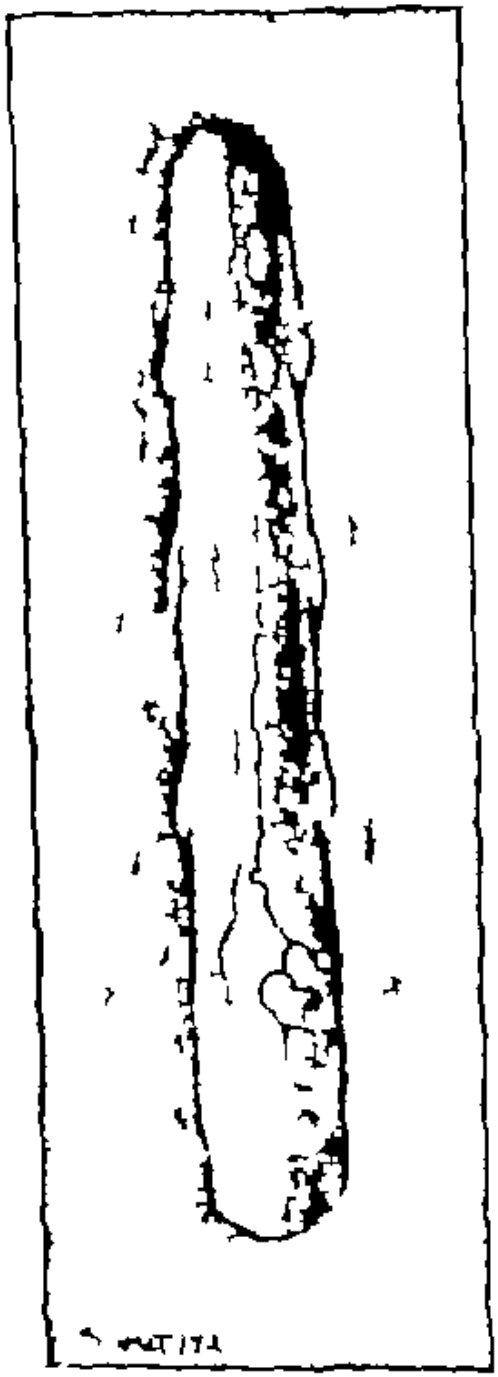

Fig 160.—See text.

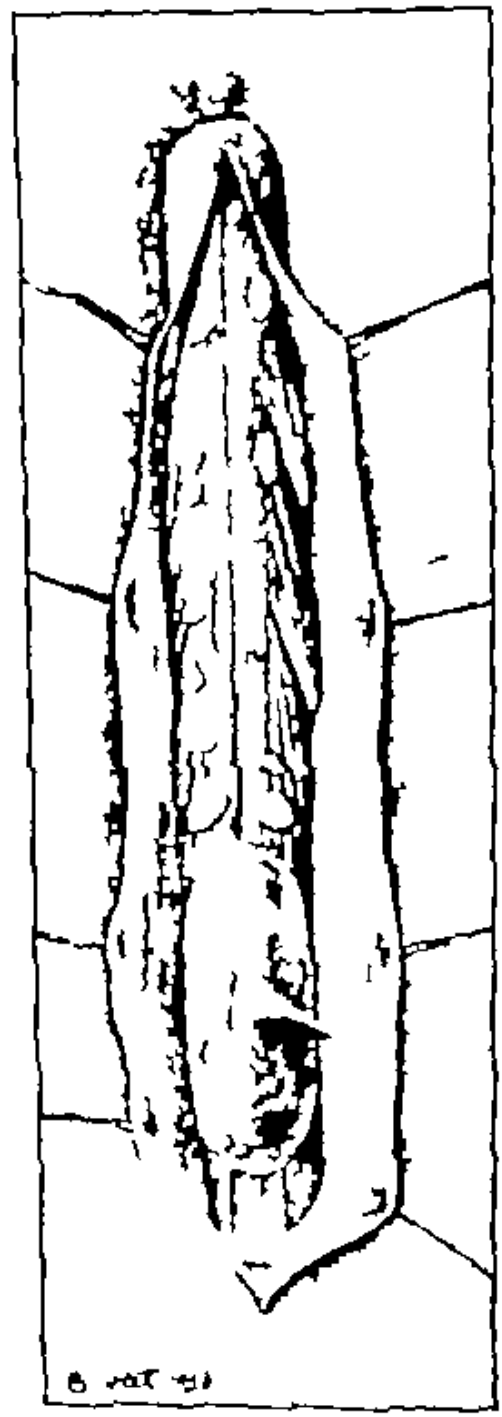

Fig 161.—See text.

all (Fig 161) Upon opening the dura the tumor was found on the dorsal surface of the cord at about the junction of the eleventh and twelfth dorsal vertebra (Fig 162) It was about

*Atrophies*.—Some wasting of the lower extremities, more on the left.

*Measurements*

| | *Right* | *Left* |
|---|---|---|
| Thigh | 53.0 cm. | 50.5 cm. |
| Leg | 34.5 | 33.5 |

*Reflexes.*

| | | |
|---|---|---|
| Abdominal | upper | ++ |
| | lower | ++ |
| Patellars | | +++ |
| Achilles | | +++ |
| Patellar clonus | | + |
| Achilles clonus | | — |
| Babinski | | + |
| Oppenheim | | + |
| Gordon | | + |

Sensory Examination.—The accompanying charts represent the conclusion of a large number of studies. Certain findings are worthy of additional comment. It should be emphasized on account of frequent errors in interpretation that the areas of hyperesthesia were areas in which the type of sensation was normal. The character of sensation was normal but appreciation of it abnormally acute. It was not simply an increased sensitiveness of a slightly abnormal or painful type such as is often loosely termed hyperesthesia.

The loss of vibration sense reached a higher level than any other lost sensation. In the lower extremities the area over which appreciation of heat was not recognized was larger than the area anesthetic to cold. Vibration sense was tested with a tuning fork (256 C.). *Joint position*. No appreciation of passive movements of any toes or of either ankle. Movements of the knees are appreciated.

Operation.—Subperiosteal laminectomy—seventh, eighth, ninth, tenth, eleventh, and twelfth dorsal spines.

The dura showed *definite pulsation at both upper and lower* limits of the exposure. The dura in the region of the eleventh and twelfth lamina showed several vessels of considerable size (Fig. 160). Above this and shining through the dura could be

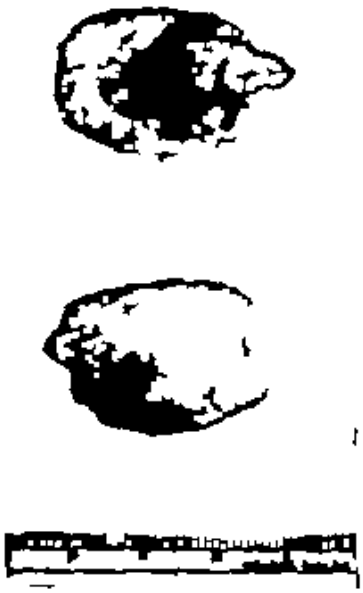

Fig. 163.—See text.

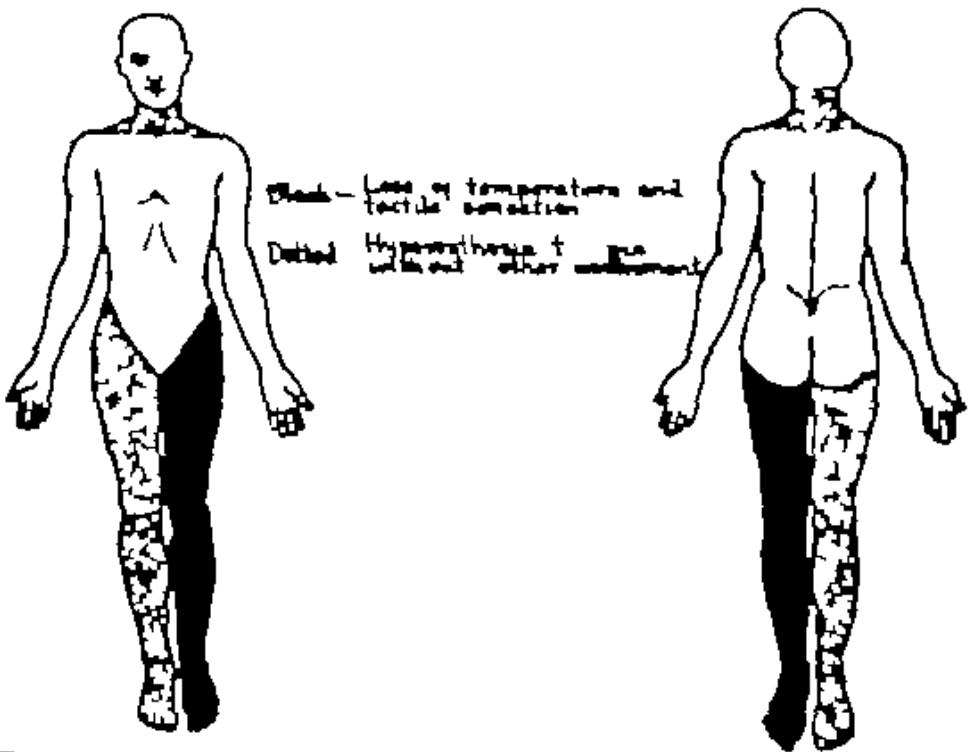

Fig. 164.—x Ray of cervical spine. \ Roentgen evidence of pathology

the size of the terminal joint of a man s thumb and markedly compressed and excavated the cord. About three-fifths of the bulk of the tumor was to the left of the midline Removal of

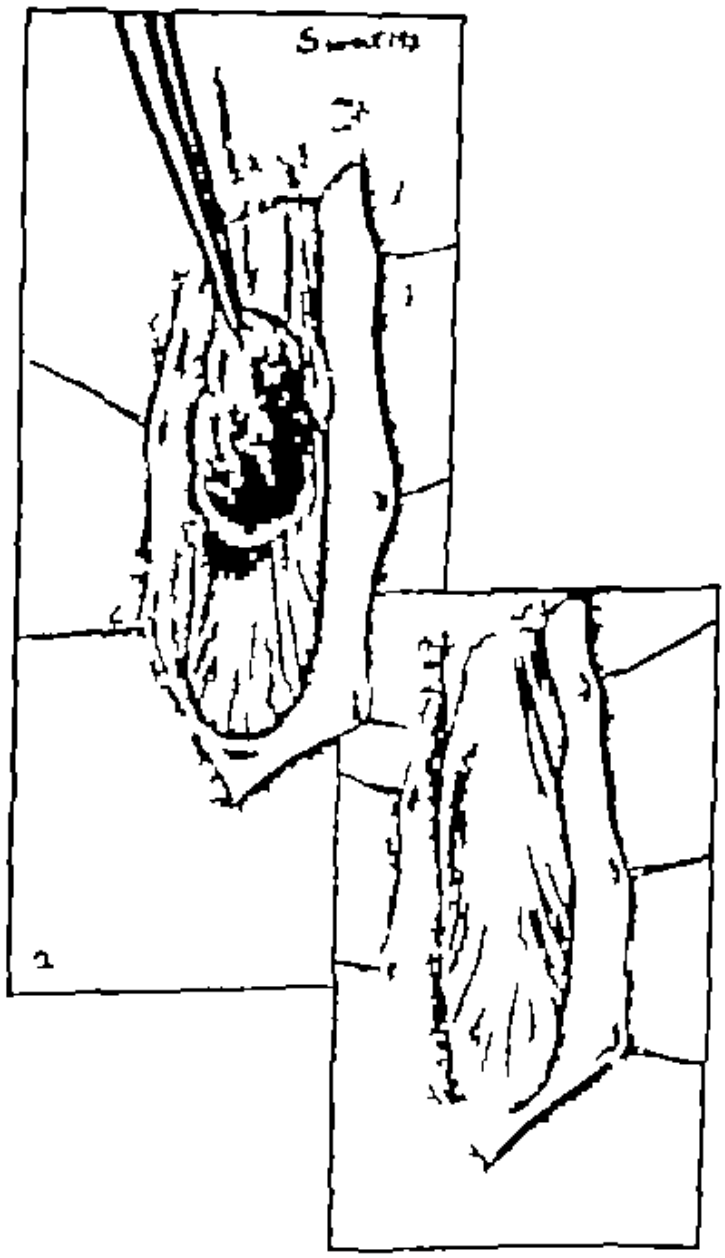

Fig 162 —See ext

the tumor and overlying dura It should be noted that the small white plaques seen bove the tumor were confined to this region. None were present below the growth. Weight of the tumor was 6.6 gm. (Fig 163)

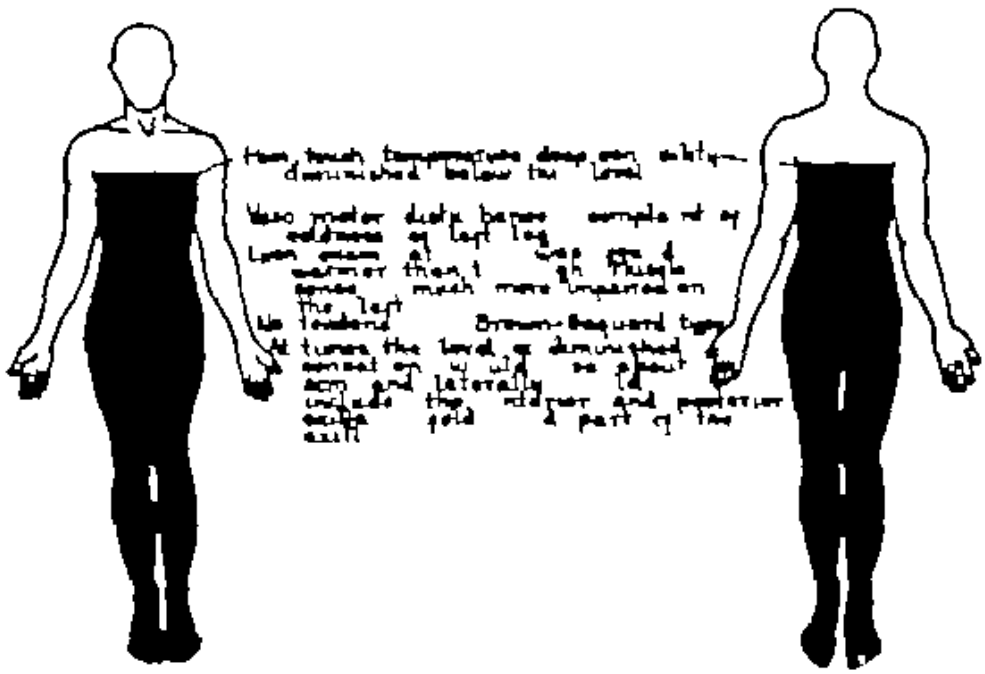

Fig. 167.—Sensory examination.

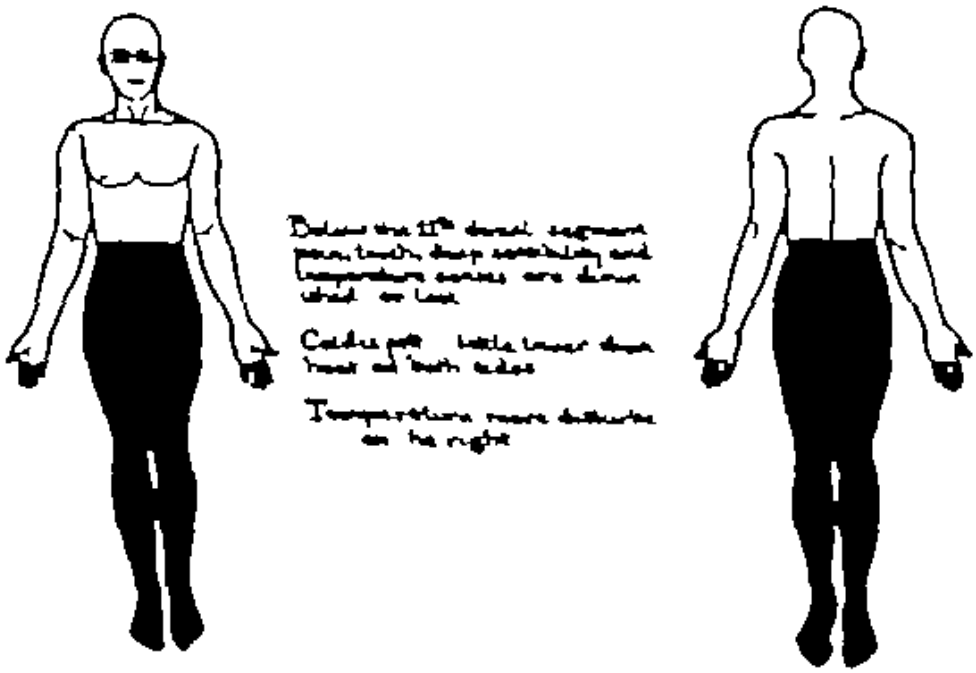

Fig. 168.—Sensory examination.

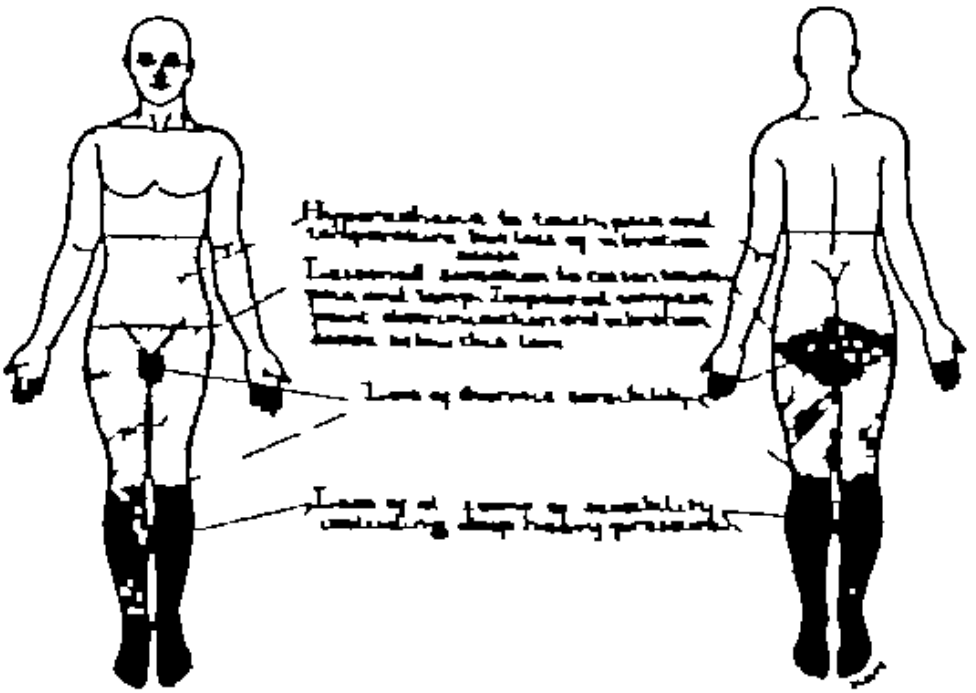

Fig. 165

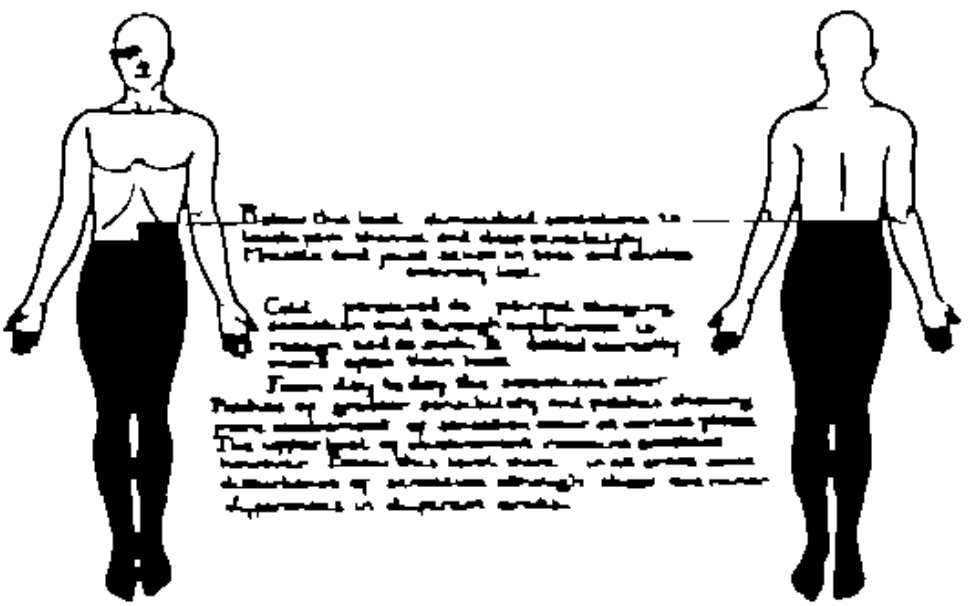

Fig. 166.

nizes pin-prick over left leg and foot. Does not recognize touch.

By the tenth day the left hip could be fully flexed with the leg extended at the knee

On the eleventh day all movements at toes, ankles, knees, and hips are restored. The rotations of the left hip are still

Fig. 170.—S. 20, 1804. General view of the more fibrous portion of the tumor but showing relatively few of the bands. Hæmatoxylin and eosin stain.

weak, however. Abduction and adduction strong on both sides. The Babinski and ankle-clonus persist on the left. The areas of hyperesthesia present before operation (see chart) persist and are but little changed. The area of total loss in black has been replaced by sensation as in the area of hyperesthesia. No bladder or rectal difficulties.

By the thirteenth day the clonus and Babinski disappeared

Pathologic Report.—"Microscopic examination of the tumor shows it to be composed of compactly growing cells often spindle shaped (Fig 170 from the more cellular portion of growth) Characteristic of the tumor is the occurrence of great numbers of whorls of cells, many of which show marked hyaline degeneration and still others, calcification. In the areas relatively free from whorls the intercellular substance is uniformly fibrous, as if composed of collagen. The blood-vessels in this growth are scanty and some show thickening of the endothelium. Some of the whorls appear to form about vessels.

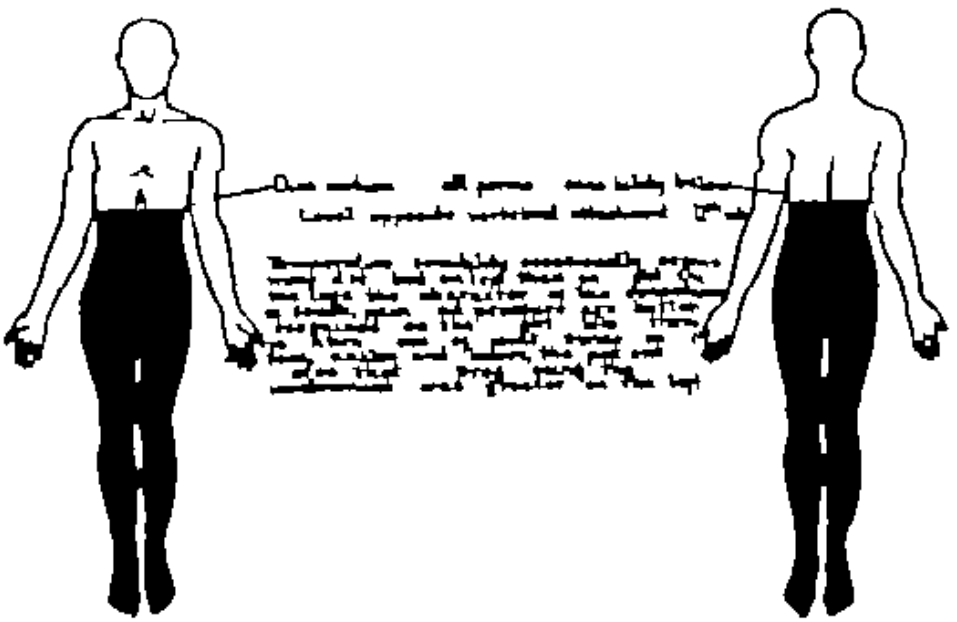

Fig. 169

Around many of the vessels there occurs a collar of cells with deeply staining nuclei, some about the size f lymphocytes, and others with more abundant cytoplasm pparently wandering cells. These nests appear to have no relation t the cells of the new growth.

Diagnosis.—Arachnoid psammofibroblastoma

Postoperative Notes.—In twenty-four hours following operation deep sensibility returned t feet.

In four days, appreciated passive movements f toes and localizes toes on left foot. Feels pressure at all poi ts Recog

logic significance. They are common findings with or without tumor Pathologic examination is reported as showing them to be fibrous plaques. It is remarkable but unexplained why in this case they should have been limited in their distribution to the region above the tumor

The type of tumor and the knowledge of the rate of growth in similar cases makes it seem reasonable that the symptoms in this case dated back ten years.

CASE II

University of California Hospital, Admission No 2126

Female white, American housewife age thirty three years.

Diagnosis.—Spinal cord tumor arachnoid fibroblastoma at level of the ninth dorsal vertebra.

Abstract of History.—Patient has frequent recurring attacks of tonsillitis with abscesses for years. Teeth were so badly carious that all were drawn at the age of nineteen years.

Three years prior to admission had a fall from a buggy following which there was pain in the back for some months. Nothing else of note in the past history

Present Trouble.—Was well up to fifteen months prior to entry First awakened every morning at 4 A. M with pain low down in the back The pain was steady not severe, and did not radiate. It disappeared upon arising

In two months this pain ceased and bilateral pains in the lower abdomen and groin appeared. This was steady dull relieved by pressure and did not radiate This lasted for a few weeks, and then, except for irregular attacks of backache there were no symptoms until eight months ago when lameness and stiffness in the left leg commenced Gradually lost control of this leg although for a long time it did not seem weak The difficulty seemed to be a stiffness.

Three months later there was burning urination. For the past three months there has been incontinence of urine and during the same time the right hip has developed stiffness and soreness.

For nearly three months there has been entire loss of rectal

Walking began on the seventeenth day The upper level of the hyperesthesia disappeared first on the right side, then on the left. The hypesthetic areas cleared rapidly in a patchy way Examination a few weeks after discharge and seven weeks from time of operation showed no neurologic abnormalities. Recovery has been complete.

Comment.—The history in this case is of ten years duration, but the symptoms during the last four months came with great rapidity The pain in the back low down on the left was probably to be regarded as a root pain, as it disappeared after operation. It was of the type, however commonly seen with a sacralized fifth lumbar and was so regarded. While the nerve findings could not, of course be explained by this anatomic abnormality it added a complication in interpreting the cause of the pain. The appearance and development of subjective sensory disturbances prior to any motor disturbance is what would be expected with a tumor in a dorsal position and more on the left than on the right.

In the sensory findings t is of interest that loss of vibratory sense was more wide-spread than the loss of any other sensation It has been our experience that sensibility to deep pressure or a hard squeeze is the last to disappear in progressive sensory loss, and is among the first if not the first to return. Considerable variation in sensory findings occur from day to day Some time is required and many studies to build up an accurate conception of the sensory changes.

The slight curvature of the spine at the tenth and eleventh thoracic vertebra, while indeed slight, was very definitely localized and was sufficient to be noted in the x ray report as suggesting a tumor This finding we have noted in ther instances, and in such a case is suggestive.

Lumbar puncture with removal of fluid gives varying effects Symptoms may be temporarily exaggerated or improved by it Occasionally it will make the upper level of the sensory involvement easier t recognize or may even cause slight shift in the sensory level.

The white plaques seen in the arachnoid have no patho-

Five years after operation this patient was last seen. Recovery had been prompt and complete. No residual symptoms or findings.

Comment.—Case II is in many ways similar to Case I. At the time of coming under observation just prior to operation the findings were practically symmetric although the history was definite regarding the side first involved. This corresponded with the left-sided location of the growth.

In both Case I and Case II the first pains experienced were relieved by standing.

In a spinal cord compression in which there is not a complete physiologic block it is to be noted that the sensory changes below the level of the lesion are not uniform. Occasionally even patches with nearly normal sensation may be found. Ordinarily however comparison of areas which on first testing seem to be normal with areas elsewhere on the body well above the level of the lesion, show some diminution in sensation, and make it evident that there is slight impairment. Likewise these areas vary from day to day.

CASE III

University of California Hospital Admission No. 6486.

Diagnosis.—Spinal cord tumor, arachnoid fibroblastoma at the level of the second dorsal vertebra.

Abstract of History.—White male, American, unmarried. Age thirty-eight years. Nothing of special note in history up to the

Present Illness.—Fifteen months prior to admission the right thigh about the middle felt as if asleep. A little later the left thigh was similarly affected. These sensations were of a stinging character, not radiating or sharp. This sensation has persisted and for the past three months the legs and knees have been stiff. The sensation in the thighs now is of pins and needles. Control of bladder and rectum was lost for a few days and then returned. Eight weeks ago following a spinal puncture control was again lost temporarily. Urination now is slow in being initiated. There has been some pain in the right

control Menstruation unaffected although the last flow was scanty pale and shorter in duration.

General Examination.—Scars of a few healed ulcers on left shin, said to have followed injuries and healed in four weeks No signs of lues. Wassermann negative *Nothing else of note* in general examination or laboratory reports. Spinal fluid not examined

Neurologic Condition.—The patient is bedridden. Legs very spastic, but show a little movement. Unable to walk, but can stand Bladder and rectal incontinence.

Reflexes.—Upper extremities and trunk negative

| | | *Right* | *Left* |
|---|---|---|---|
| Abdominals | upper | ++ (normal) | ++ |
| | lower | − | + |
| Patellar reflex | | ++++ | +++ |
| Achilles | | ++++ | ++++ |
| Patellar clonus | | − | − |
| Achilles clonus | | ++++ | +++ |
| Babinski | | + | +? |
| Oppenheim | | + | − |

Operation.—Subperiosteal laminectomy showed dural pulsations down to the ninth dorsal vertebra.

Several whitish plaques showed through the dura. At the level of the ninth lamina tumor 2 x 2 x 1 cm was found on the left posterolateral surface of the cord. It was attached to the dura, t which point a vessel entered the growth It was encapsulated smooth, firm and readily enucleable The dura was resected with margin

Pathologic Diagnosis.—Arachnoid psammonbroblastoma.

Postoperative Progress.—On the thirteenth day after operation patient was able to control and to pass urine voluntarily The spasticity f the leg had disappeared Knee and Achilles jerks normal but a trifle livelier on the left Plantar reflexes normal. *Pin felt everywhere* but sharper on the left. *Muscle* sense still defective although it has improved little on the left. No pain in abdomen, back, or extremities.

Twentieth day muscle sense in right toes normal. Slight impairment on left. Sensations t pin normal.

After incision of the arachnoid it was easily shelled out. The tumor was smooth and firm

Pathologic Report (Fig 171) — The microscopic examination in this case is made from a single section which has been preserved. The relation of the growth to the dura cannot be made out from the section. On one side the growth consists of

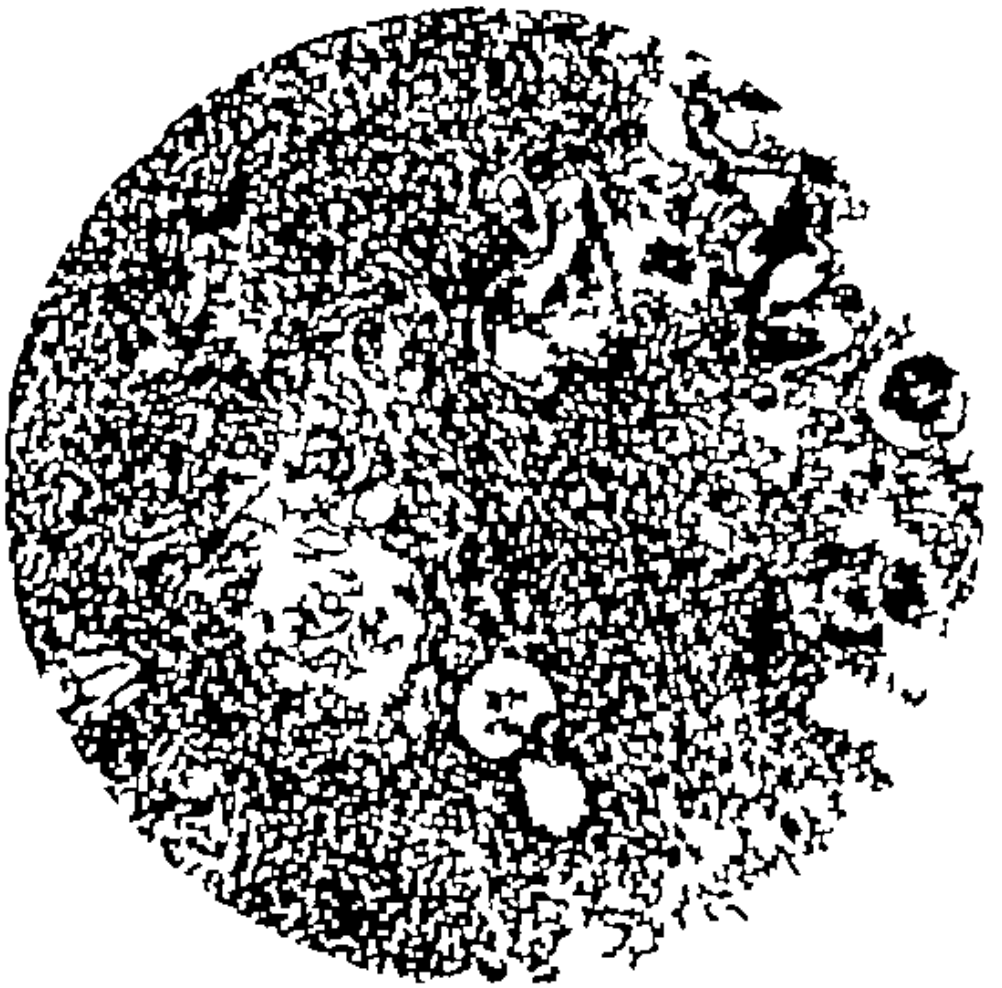

Fig 171 —S. 13, 336 Thickened hyaline walls of vessels A, hyalinized area, result of recanalization containing pigment. Hematoxylin and eosin stain.

a laminated moderately cellular structure, the outline of the cell protoplasm cannot be made out, but between the nuclei is a homogeneous intercellular material suggesting collagen material. Further inward the structure changes to a quite irregularly disposed layer again moderately cellular the nuclei varying slightly in size. In the meshes of this tissue is a moderate amount of edema Within this layer again the growth

lower abdomen, of the same sharp stinging character and it spreads up over the left side of the thorax to the nipple Weakness in the left leg first appeared seven months ago and has progressed. There is much complaint of coldness in the left leg *and but little on the right.*

General Physical Examination.—No findings apart from the neurologic condition which have a bearing on present trouble Wassermann on blood and spinal fluid negative. Spinal fluid negative. Blood and urine negative. Clonus rate at ankles, 5 75 per second and equal on both sides.

Neurologic Examination. –The patient is an unusually strong, well-muscled man, able to walk with difficulty Gait is spastic, the left leg swings out and is evidently very weak. It appears slightly smaller than the right. While under observation the paralysis increased so that he became unable to walk without *aid*

Cranial nerves and upper extremities uninvolved.

Lower extremities weak. Weakness more marked on left. All movements, however can be performed

*Measurements*

| | *Right* | *Left* |
|---|---|---|
| Calf | *34 8* | *34* |
| Lower thigh | 43 | 42 8 |
| Upper thigh | 52 | 51.5 |

*Reflexes*

| | | |
|---|---|---|
| Patella | +++ Very lively | ++++ |
| Achilles | ++ Very lively | +++ |
| Knee clonus | + | ++ |
| Achilles clonus | + | + |
| Oppenheim | + | + |
| Babinski | + | + |
| Upper abdominal | – | – |
| Lower abdominal | – | – |
| Cremasteric | – | – |
| Sphincter ani | – | – |

*Operation.—Subperiosteal laminectomy* Opposite the third dorsal lamina was found a tumor 2 x 1½ 1 cm. lying beneath the arachnoid. It lay just to the left of the midline posteriorly

About one and a half years after operation the patient wrote back a doleful letter complaining that the operation had undoubtedly done him permanent damage as for two weeks he had been having pain between his shoulders at the site of the operation. This complaint was accompanied by no other statement. He was urged to return for examination, which he did It developed upon questioning that he had been working as a teamster driving a pair of mules. In a runaway the wagon was overturned and the driver thrown a distance of 15 feet, striking on his back and shoulders. The soreness and pain followed this but had practically disappeared when he was examined three weeks later His neurologic examination was negative. This demonstrates once more not only the incom pleteness of patient s reports but what trauma a laminectomized spine can tolerate without damage

CASE IV

Children s Hospital No 13,539

Diagnosis.—Spinal cord tumor psammofibroblastoma.

Abstract of History.—White woman, married, fifty-eight years of age. Eight months prior to admission began to have a dull boring intermittent pain in left hip Six months ago its severity was great enough to confine patient to bed for four days One month after onset the right toes felt as if there was a cushion under them. Five months ago numbness began in right foot and six weeks later it appeared on the left. As these sensations gradually appeared pain in the left hip decreased The numbness gradually extended to above both knees but more pronounced on the right. Never any shooting pains or paresthesia Ataxia accompanied the numbness. Unable to walk in the dark and walks poorly unless assisted. No gastric symptoms. Urination is imperative but no incontinence or retention. Has been nervous all of life. This has increased during present trouble. Has had exophthalmos for twenty-five years much worse in the last four years. Uniform enlargement of lower neck for many years. Perspires but little, although palms are always moist. Never any diarrhea. For the last

appears irregularly more cellular the cells tending to form concentric whorls, *not about themselves, but about the blood-vessels* and rarely about hyaline masses, which apparently are derived from blood- vessels. In between the cells the intercellular material is uniform and has the appearance of collagen fibers so far as one can judge from hematoxylin and eosin staining. The tumor is quite vascular the vessels in general being relatively large with thickened hyaline walls some of the vessels show evidence of being thrombosed, with subsequent recanalization, this apparently being responsible for some of the occurrence of the larger fibrous masses. In some such areas cells containing pigment, apparently derived from blood, occur in these hyaline masses.

Diagnosis.—Arachnoid fibroblastoma.

Postoperative Notes.—In twenty four hours after operation the patient stated that he could use his leg better Less spasticity present. Cold over the lower abdomen now gives a normal sensation. On the fourth day the upper level of sensory change had disappeared Passes urine without difficulty Sensation to pin seems everywhere normal. There is less exaggeration of the patellar jerks and ankle-clonus has disappeared.

Discharged in one month, walking alone without difficulty Six weeks later no neurologic abnormalities were present Recovery was complete. Had been doing hard labor for several months.

This patient was seen and examined four years after the operation. No symptoms and negative neurologic findings Recovery complete.

Comment.—In Case III, as in Case I there was an alteration in symptoms following lumbar puncture Following it there was a temporary incontinence of bladder and rectum which disappeared in a few days.

The initial symptoms were paresthesia in both thighs on the antero-external surfaces These were obviously not root pains on account of their location The patient's description of them suggested the possibility of a separate condition—meralgia paresthetica, although they were bilateral and progressive

Temperature sense markedly involved on the right below the level of the great trochanter On the left there was but slight disturbance, and this was confined to leg and foot. Muscle and joint and deep sensibility seemed equally disturbed on both sides, and was completely gone in toes, ankles and knees. The disturbance of touch and pain was slight and variable.

Examination of Back.—Shows some general stiffness of spine. No alteration in alinement. No tenderness.

Six Weeks Later.—The patient is now bedridden and unable to make any movement of the extremities except an almost imperceptible movement of the right great toe. The spasticity of the extremities has given way to complete flaccidity with lost deep reflexes and complete incontinence. The sensory changes have deepened Loss of temperature touch pain, and most forms of deep sensibility is now everywhere marked. Very deep heavy pressure of calves and feet can, however be appreciated.

Operation.—Subperiosteal laminectomy

Opposite the bodies of the ninth and tenth dorsal vertebra an intradural extramedullary tumor was found in the left posterolateral position. There was no attachment to dura. The tumor was about 1½ cm in diameter smooth, firm and glistening Readily enucleated without bleeding A very marked deep hollow remained in the cord, which appeared to be reduced to about one half its thickness.

Pathologic Diagnosis.—Arachnoid fibroblastoma.

Postoperative Course.—On the third day after operation the patient suddenly became irrational and developed a psychosis to which it was thought her thyroid disease was a contributing factor Her mental condition cleared up completely in five weeks

Examination in five weeks showed voluntary movement through about half the normal range at hips and knees Very slight movement at ankles and none at toes. Knee-jerks both present Achilles present in the right, absent on the left. Plantar responses atypical on the right and absent on the left. No clonus at knees or ankles but a few jerks present on the left.

three years has palpitation upon exertion. No dyspnea. Has had non-productive irritable cough for five years. Has lost 8 pounds in weight in the past year

Progress.—This patient was under observation and medical treatment for two months. During this time the paraplegia became complete

Nothing of note in family or past history except that the patient has had exophthalmic goiter for years and arthritis of finger joints with nodes.

General Physical Examination.—The patient appears older than her age, shows marked exophthalmos, with a moderate uniform thyroid enlargement. Erythema over neck with marked pulsation in neck vessels. Fine tremor Enlarged heart 3 cm outside nipple line in fifth space with a systolic murmur over apex. While at rest in bed pulse rate averages 98 per minute.

There is an arthritis of finger joints. N thing else f note in general examination.

x Rays f spine are negative except for a hypertrophic arthritis Spinal fluid showed 12 lymphocytes per cubic millimeter Noguchi and Nonne faintly positive Wassermann negative. No alteration in neurologic findings following spinal puncture. Blood-pressure varies from 250 to 265 systolic. Diastolic not noted

Neurologic Condition.—When the patient first came under observation about six weeks prior to operation she had a spastic paraplegia and was unable to walk without assistance. The lower extremities showed hyperactive patellar and ankle-jerks on both sides. There were repeated jerks, but not well-sustained clonus at knees and ankles. Babinski and Oppenheim reflexes present on both sides. N atrophies w re present The motor weakness was greater on the left, evident in the knee flexors and extensors, and in all ankle movement The belly muscles contracted equally and well.

Sensory *changes* just above the crests of ilia. Below this level the degree of sensory involvement increased toward the feet with some tendency t Brown-Séquard syndrome

stiff and at times reeling She would bump against people with whom she was walking Two years ago she was forced to use a cane. One and a half years ago she could not get about without crutches. Just before this time she began to pass urine and feces involuntarily Her incontinence has per sisted to date. She has not had retention of urine at any time necessitating catheterization One year ago she was forced to take to her bed. She has not walked since that time. Her pains have persisted in the legs and are of a dull aching char acter Around the waist line she has a numbness with marked sensation of pins and needles sticking her

Examination.—The patient is a tall and very stout woman weighing 253 pounds. On general physical examination nothing of importance as having bearing on her neurologic condition was found. The abdomen shows numerous scars of burns from too hot applications.

Blood-pressure 140/88

Aside from numerous hyaline and granular casts in the urine there were no abnormalities in laboratory work including blood, blood Wassermann complete spinal fluid examination, roent genograms etc. No neurologic abnormalities in cranial nerves or upper extremities.

Neurologic Status.—The patient is completely paralyzed below the waist The only voluntary movement is a very faint movement in the toes and this is not always present. There has been complete incontinence of bladder and rectum for ove one and a half years The lower extremities are mod erately spastic The patient states that the left leg has been more affected both in power and deep sensibility All the involved parts below the upper level of paralysis feel compressed.

*Reflexes*

| | *Right* | *Left* |
|---|---|---|
| Abdominals | Absent | Absent |
| Patellars | Greatly increased | Greatly increased |
| Achilles | Greatly increased | Greatly increased |
| Patellar clonus | Present | Present |
| Babinski | Present | Present |
| Oppenheim | Absent | Absent |
| Gordon | Absent | Absent |

The patient was able to recognize the position of all joints except toes. Other forms of sensibility all show marked improvement.

In two months after operation this patient reported by letter that she was up and about the house and had walked to a post box one block away without a cane or other assistance The sphincter disturbances had cleared up There has been no opportunity to determine the later course of this case.

It seems certain that this patient must have improved greatly following the last report. The degree of improvement at that time was satisfactory

Comment.—This patient was in poor physical condition, and on account of her thyroid disease and high blood-pressure was a poor operative risk. It is t be noted particularly that at the time of her operation her paraplegia had changed from a spastic to a flaccid one In view f the presence of flaccidity a very doubtful prognosis was given and t was with some surprise that her improvement was f llowed. The flaccidity had, of course been of very short duration.

CASE V

University f California Hospital, Admission No 26,822

White woman, married housewife American. Age sixty years.

Diagnosis.—Spinal cord tumor Arachnoid psammofibroblastoma at level of fifth dorsal vertebra.

Complaint.—Paralysis below level of lower ribs

Abstract of History.—Family history of cancer on father side. Patient has had two miscarriages and one son died of convulsions as an infant Patient had typhoid at age of seven years At the age of twenty five years fell from carriage and injured back Recovered in few days. Has had dyspnea and palpitation on exertion. No other facts f importance until

Present Illness.—Has had weak and painful back for many years. Five years ago first noticed that her legs were weak and painful. Her legs often jerked involuntarily The pains were f a dull aching character She grew progressively more weak and suffered more pain. Her gait, she tates was

varies considerably Quite characteristic of the growth is the occurrence of numerous whorls some quite cellular and a few hyaline, but most of them extensively calcified. With a Weigert s elastic tissue (Fig 173) stain there is abundant formation of elastic tissue derived from tumor-cells as well as the occurrence of the same tissue in and about the whorl formation."

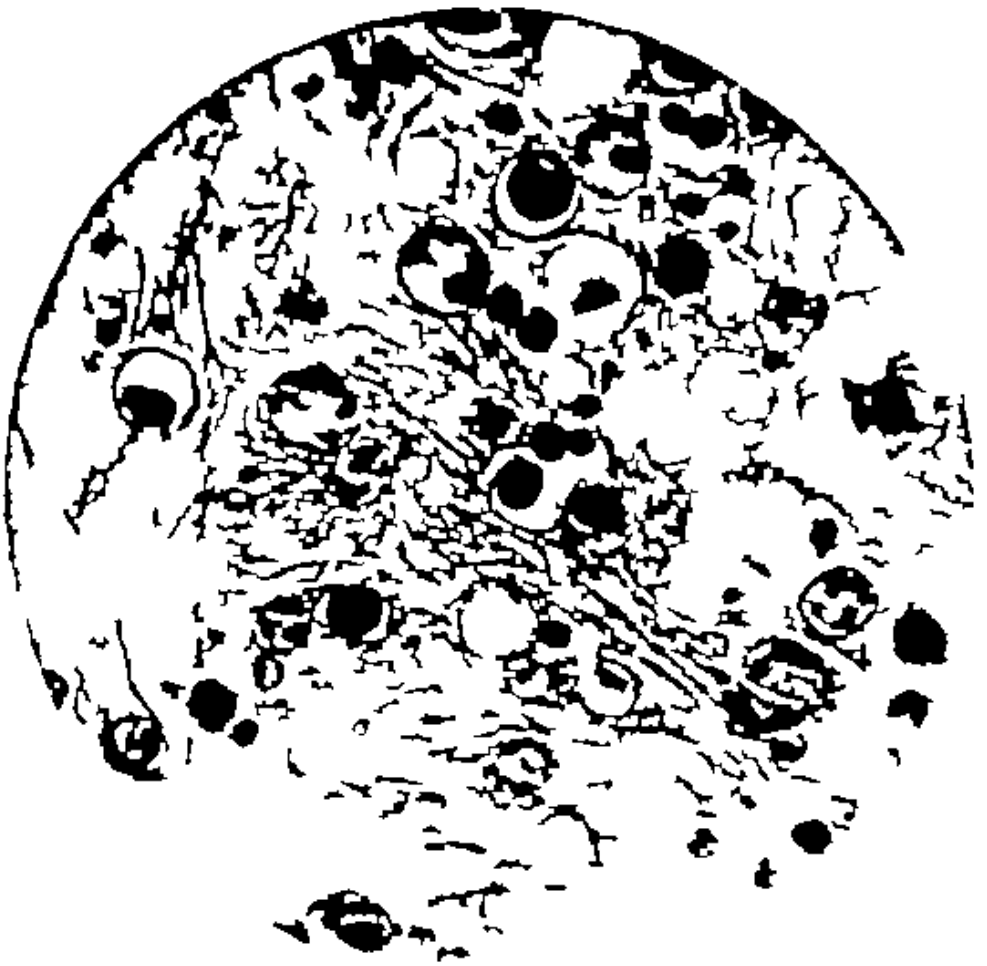

Fig 173.—S. 20, 211. Weigert' elastic tissue stain

**Diagnosis.**—Arachnoid psammofibroblastoma

**Postoperative Notes.**—Third day—able to move great toes.

Fourth day—able to move all toes.

Sixth day—slight movement of left ankle.

Nineteenth day—flexes knees slightly Thigh flexors move Toe and ankle movements are stronger All movement greater on left than on right. Power and sensation slowly returned.

**Comment.**—The tumor in this case was the largest of the

Spinal puncture produced no alteration in findings.

*Sensory Examination* —

Operation.—Laminectomy

An extramedullary tumor measuring 2½ x 1½ x 1½ cm. found at the level of the fifth dorsal lamina. It occupied a right lateral position. The cord was dislocated to the left and pressed

Fig. 172.—Case 20, 211. General view of tumor. Hematoxylin and eosin stain.

against the dural canal. The growth was attached to the dura. After removal of the tumor and resection of the dura the cord appeared indented to about one-third of its normal thickness.

Pathologic Report (Fig. 172).—Microscopic examination shows a growth composed of spindle-shaped cells with varying amount of intracellular substance. In some areas the cell masses form interweaving strands. The intracellular substance

CASE VI

University of California Hospital, Admission No 35 /01

White woman, married twenty four years of age. American.

Diagnosis.—Spinal cord tumor arachnoid fibroblastoma at the level of the fifth and sixth cervical vertebra

Abstract of History —Malaria at nine years Frequent sore throats till tonsillectomy three years ago Three years ago some small tumors of unknown nature removed from left forearm and left ankle. Some trouble with hemorrhoids for several years Nothing else of significance in family past menstrual or marital history

Present Illness.—Three and a half years prior to admission began to have a stiff neck with aching as if she had received a blow This radiated to the left shoulder This was aggravated by jarring as in riding in a machine. This trouble was intermittent, but became progressively worse. In two months from the onset the left hand began to flex and became weak until it was difficult to open the hand No atrophy noticed Two months after the onset the left hand began to trouble her the left foot was noted to drag slightly in walking and the toe of the shoe was worn. Was able however to walk and dance. Gradual improvement was noted in the next few months and one and a half years after the onset of her trouble she was having but little difficulty with either the hand or leg although her parents noted that they were not used normally The condition then remained stationary until six months ago which was at the time of a confinement. Shortly after the birth of the baby the fingers of the right hand began to flex just as the left hand had begun three years before. This rapidly became worse and in ten days the right leg had become so weak it could not be drawn up in bed. The ache in the neck again appeared, usually being in the midline and radiating to the left shoulder During the past three months the ache has not been so troublesome but the loss of power in the right side has progressed rapidly and to a less extent the former paralysis of the left side has returned At present is unable to walk and the right hand has shrunken. Has never been able to move the

series, and the thinning of the cord from the compression was the greatest. The paralysis was of long duration and dated back five years. It had been practically complete for one year and the loss of bladder and rectal control for one and a half years. The patient's mental attitude of utter hopelessness, her inaccuracy and inattention to sensory tests, and her huge size added greatly to the difficulties.

It seemed extremely unlikely that with such a paralysis and the long-continued incontinence that any very great improvement could occur. The only favorable feature was that the compression had been slow.

This case demonstrated what we have seen in others, namely that a functional paralysis may remain even after actual recovery has occurred. This patient was returned home in an ambulance three weeks after operation. Movements as noted in the history were present. She was not seen again by the writer for several weeks. Her mental attitude was unchanged. She would admit of some return of movement but denied any power. *She was still bedridden and knew she would remain so.* Her mental depression, unwilling to make any effort, was striking. Her attitude was one of complete resignation.

It was possible in one week to have her up and moving from bed to chair and in a few weeks she was about the house using a cane. The long-continued paralysis had entailed, of course, great muscular weakness. While there was some joint stiffness, it was not marked and was, particularly in person of her age, in marked contrast to the greater joint stiffness seen after long-continued disease or immobilization in various other conditions.

In view of the history recovery was remarkable. In eight months after operation this patient was doing her own housework. She walked slowly and carefully but steadily. After sitting there was stiffness upon arising. There was no incontinence of bladder or rectum. Recovery of their functions seemed complete. Her deep reflexes were slightly hyperactive but there was no spasticity and no sensory changes were present.

CASE VI

University of California Hospital Admission No 35 701

White woman married twenty four years of age. American.

Diagnosis.—Spinal cord tumor arachnoid fibroblastoma at the level of the fifth and sixth cervical vertebra

Abstract of History.—Malaria at nine years Frequent sore throats till tonsillectomy three years ago Three years ago some small tumors of unknown nature removed from left fore arm and left ankle Some trouble with hemorrhoids for several years. Nothing else of significance in family past menstrual or marital history

Present Illness.—Three and a half years prior to admission began to have a stiff neck with aching as if she had received a blow This radiated to the left shoulder This was aggravated by jarring as in riding in a machine. This trouble was intermittent, but became progressively worse. In two months from the onset the left hand began to flex and became weak until it was difficult to open the hand. No atrophy noticed. Two months after the onset the left hand began to trouble her the left foot was noted to drag slightly in walking and the toe of the shoe was worn. Was able however to walk and dance. Gradual improvement was noted in the next few months and one and a half years after the onset of her trouble she was having but little difficulty with either the hand or leg although her parents noted that they were not used normally The condition then remained stationary until six months ago which was at the time of a confinement. Shortly after the birth of the baby the fingers of the right hand began to flex just as the left hand had begun three years before This rapidly became worse and in ten days the right leg had become so weak it could not be drawn up in bed. The ache in the neck again appeared usually being in the midline and radiating to the left shoulder During the past three months the ache has not been so troublesome but the loss of power in the right side has progressed rapidly and to a less extent the former paralysis of the left side has returned At present is unable to walk and the right hand has shrunken. Has never been able to move the

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It seemed extremely unlikely that with such a paralysis and the long-continued incontinence that any very great improvement could occur. The only favorable feature was that the compression had been slow.

This case demonstrated what we have seen in others, namely that a functional paralysis may remain even after actual recovery has occurred. This patient was returned home in an ambulance three weeks after operation. Movements as noted in the history were present. She was not seen again by the writer for several weeks. Her mental attitude was unchanged. She would admit of some return of movement but denied any power. She was still bedridden and knew she would remain so. Her mental depression, unwilling to make any effort, was striking. Her attitude was one of complete resignation.

It was possible in one week to have her up and moving from bed to chair and in a few weeks she was about the house using a cane. The long-continued paralysis had entailed, of course, great muscular weakness. While there was some joint stiffness, it was not marked, and was particularly in a person of her age in marked contrast to the greater joint stiffness seen after long-continued disease or immobilization in various other conditions.

In view of the history recovery was remarkable. Eight months after operation this patient was doing her own housework. She walked slowly and carefully but steadily. After sitting there was stiffness upon arising. There was no incontinence of bladder or rectum. Recovery of their functions seemed complete. The deep reflexes were slightly hyperactive but there was no spasticity and no sensory changes were present.

foot-drop but slight voluntary power is present in the dorsal extensors of the foot and toes. Posterior calf muscles strong Movements at knee nearly complete but moderately weakened. Iliopsoas weak. Much adductor spasm.

*Reflexes*.—No pupillary changes. No Horner syndrome. Tendon reflexes in the upper extremities were hyperactive but equal on both sides. Abdominals not obtained on either side

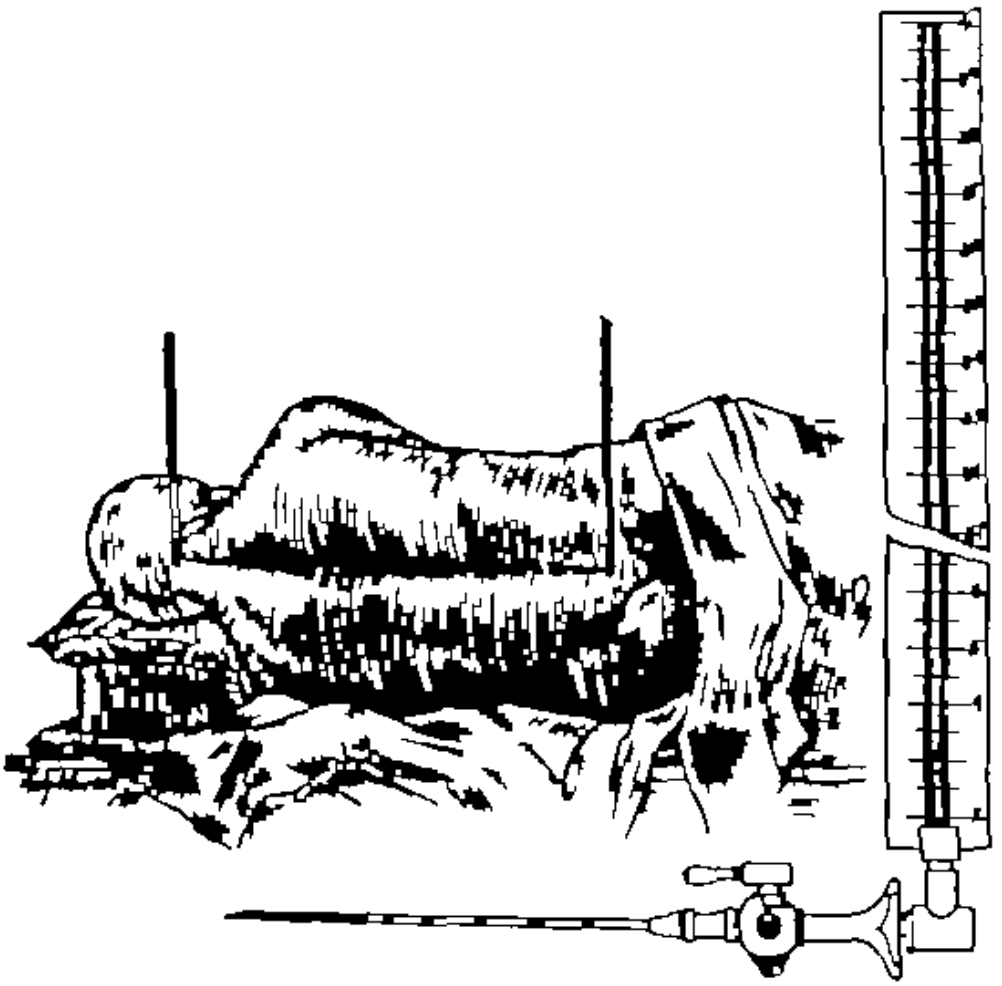

Fig. 174.—See text.

In the lower extremities tendon reflexes greatly increased both at knee and ankle, with ankle-clonus on the right. The left patellar was more lively than the right. Clonus not sustained on the left. Babinski positive on both sides. Oppenheim present on the right, absent on the left. No Gordon or other pathologic reflexes found

Sensory Examination.—The positive findings were as dia

right ankle since the leg became involved. No movement in toes. Slight movement in right hip and knee. Recently urination has been imperative but no incontinence of bladder or bowel.

Examination.—Nothing of particular note in general physical examination other than a marked deflection of nasal septum, a few carious teeth, and much injected tonsils. Thorax, abdomen, and pelvic organs essentially negative. Blood-pressure 96 systolic, 60 diastolic. Blood-count and urinalysis negative. Wassermann in blood-serum negative. Stool examination negative. The significant findings were

A well-nourished young woman, bedridden, with a paralysis of all extremities which is not quite complete. There is obvious atrophy of the intrinsic hand muscles on both sides and bilateral foot-drop.

*Upper Extremities*.—The right upper extremity shows a marked atrophy of the thenar and hypothenar eminences and of all the intrinsic hand muscles and their movements are lost. The hand remains flexed and the grip is almost nil. The long flexors are spastic and the fingers straighten with difficulty. Slight flexion and extension of the wrist are possible but are greatly weakened. There is slight atrophy of the forearm muscles. Movements at the elbow complete. Biceps very much stronger than triceps. Movements of the shoulder girdle show little if any impairment.

The left upper extremity shows in the hand the same findings as on the right, though less in degree. The grip is, however, fairly good. The long forearm extensors and flexors are quite strong.

*Abdomen*.—The rectal and oblique muscles seem spastic on both sides equally.

*Lower Extremities*.—The right leg is extremely spastic. Foot-drop complete. No power in the external popliteal group of muscles. Slight power in gastrocnemius and soleus. No toe movements. The iliopsoas acts slightly, moving the hip-joint only about 15 degrees. The quadriceps and hamstrings are weak, but contract. Much adductor spasm.

The leg can be moved fairly well but is spastic. There is

The importance of this difference and the value of comparative examinations of these fluids was vitiated by the fact that a first spinal puncture a few days before had caused a little bleeding to which the xanthochromia and increase in protein could be due. The cistern fluid examination cell count, globulins, gold chlorid sugar reduction, and Wassermann were normal in all respects.

The combined puncture however gave ample proof that there was not free circulation of spinal fluid between the cistern and the lumbar levels. The pressure adjustments were slow and incomplete The marked respiratory and pulse oscillations in the cistern pressure are noteworthy as compared with the absence of pulse and the slight respiratory excursion in the lumbar manometer Also the insignificant pressure changes in the lumbar region as compared with the cistern on compressing the jugulars and causing cerebral venous conjunction.

Operation.—Subperiosteal laminectomy with removal of spines and lamina from the fourth fifth sixth, and seventh cervical and the first thoracic vertebra

Pulsations of the dura could be seen at the upper limit of the exposure but not below Upon opening the dura it was found that the cord was elevated and unusually prominent at the level of the fifth lamina (Fig 175) A rounded bulging of the cord was evident at the right of the cord. The growth involved the right lateral portion of the cord and seemed to fuse with it. No definite line of demarkation or cleavage was apparent While the lower margin of the enlargement seemed fairly definite, it gradually fused and was lost above Careful separation at the region where its limits were best defined was begun, and it was found that the neoplasm extended from the right side over the ventrolateral and ventral surfaces of the cord. It was not an infiltrating growth but seemed to invade the cord by being pushed into it from in front. The total length of the growth was 2½ cm. It was crumbly and friable and clinically resembled the arachnoid fibroblastomata. The lateral portion of the growth and as much of the ventral portion as could be taken without injury to the cord was removed. It

grammed. No sensory changes were made out in the upper extremities. The various forms of deep sensibility were unimpaired on either side. This examination was difficult and the patient tired quickly

First spinal puncture Only a very small amount of fluid was obtained insufficient for all examinations. Wassermann on this was negative

Combined cistern and lumbar puncture under ether gave the following striking results. Fluid readily obtained at both sites. No fluid withdrawn (Fig 174)

*Manometer Readings*

(Millimeters of spinal fluid)

| Cistern | Lumbar puncture |
|---|---|
| 272 | 262 |

Four c.c were then drawn from the lumbar needle. After two minutes the readings were

| | |
|---|---|
| 300 | 156 |

The oscillation of the column of fluid in the lumbar manometer was slight, showing only faint respiratory movement. At the cistern the fluctuation was much greater showing both respiratory and pulse oscillations. The discrepancy in the readings remained approximately constant for several minutes. Then the level of the lumbar manometer rose and finally both became stationary

*Readings*

| Cistern | Lumbar |
|---|---|
| 360 | 232 |

Eighteen c. were then withdrawn from the cistern needle with immediate drop in that manometer

Readings after several minutes

| Cistern | Lumbar |
|---|---|
| 270 | 225 |

Pressure over the jugulars released

| | |
|---|---|
| 137 | 206 |

The cerebrospinal fluid from the cistern was water clear That from the lumbar region was slightly xanthochromic—faintly straw colored.

the right side of the cord was excised and allowed to remain open for decompressive purposes.

Pathologic Examination (Fig 176) — Microscopic examination of the growth shows it to be composed of interweaving strands of tissue, the cells of which are spindle shaped and there is relatively abundant intercellular substance which gives

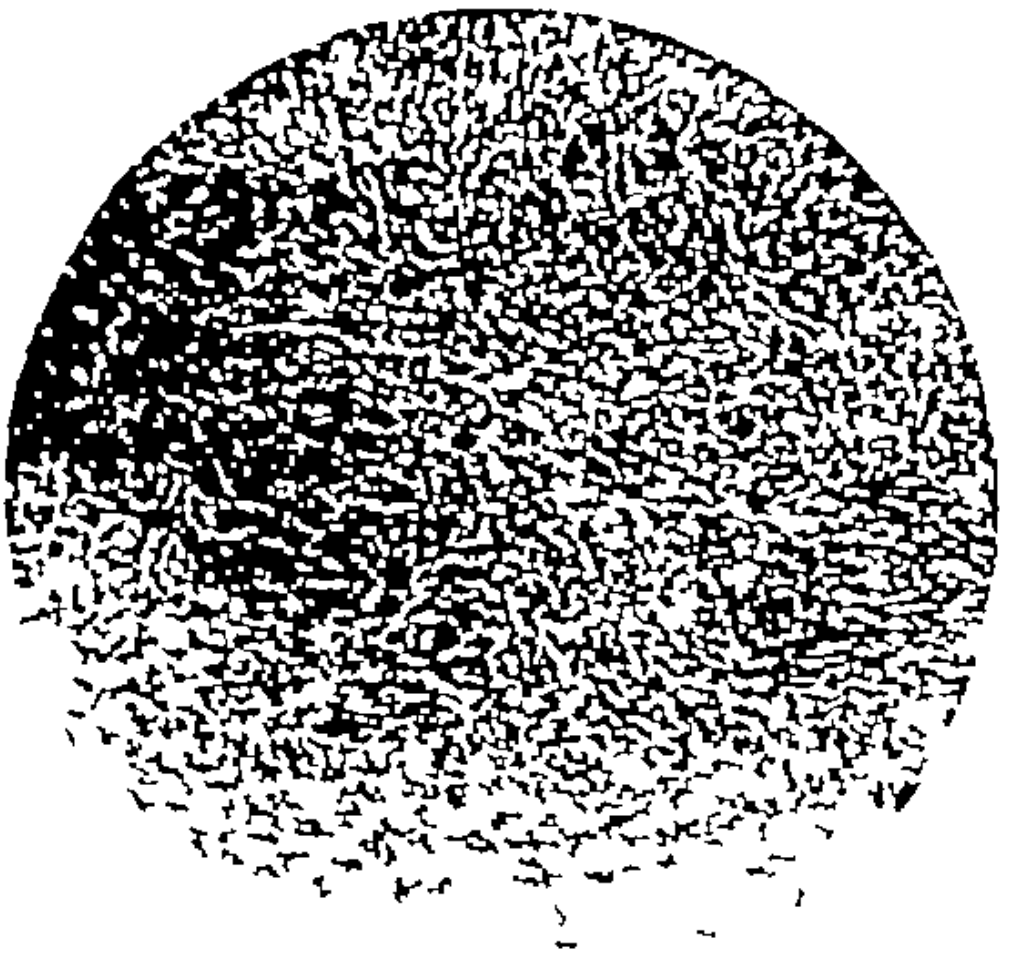

Fig 176—S 21 1947 General appearance of tumor Hematoxylin and eosin stain. (See text)

the analin blue reaction of Mallory after zenkerization. No elastic tissue was found in this growth. There is also a total absence of whorl formation The growth is fairly vascular and diffusely unusually edematous.

Diagnosis.—Arachnoid fibroblastoma.

Postoperative.—Convalescence was rapid and uneventful No retention of urine No abdominal distention. On the

appeared that the growth had originated on the ventral surface of the cord approximately in the midline and that it had grown back, pushing its way into the cord and finally toward the

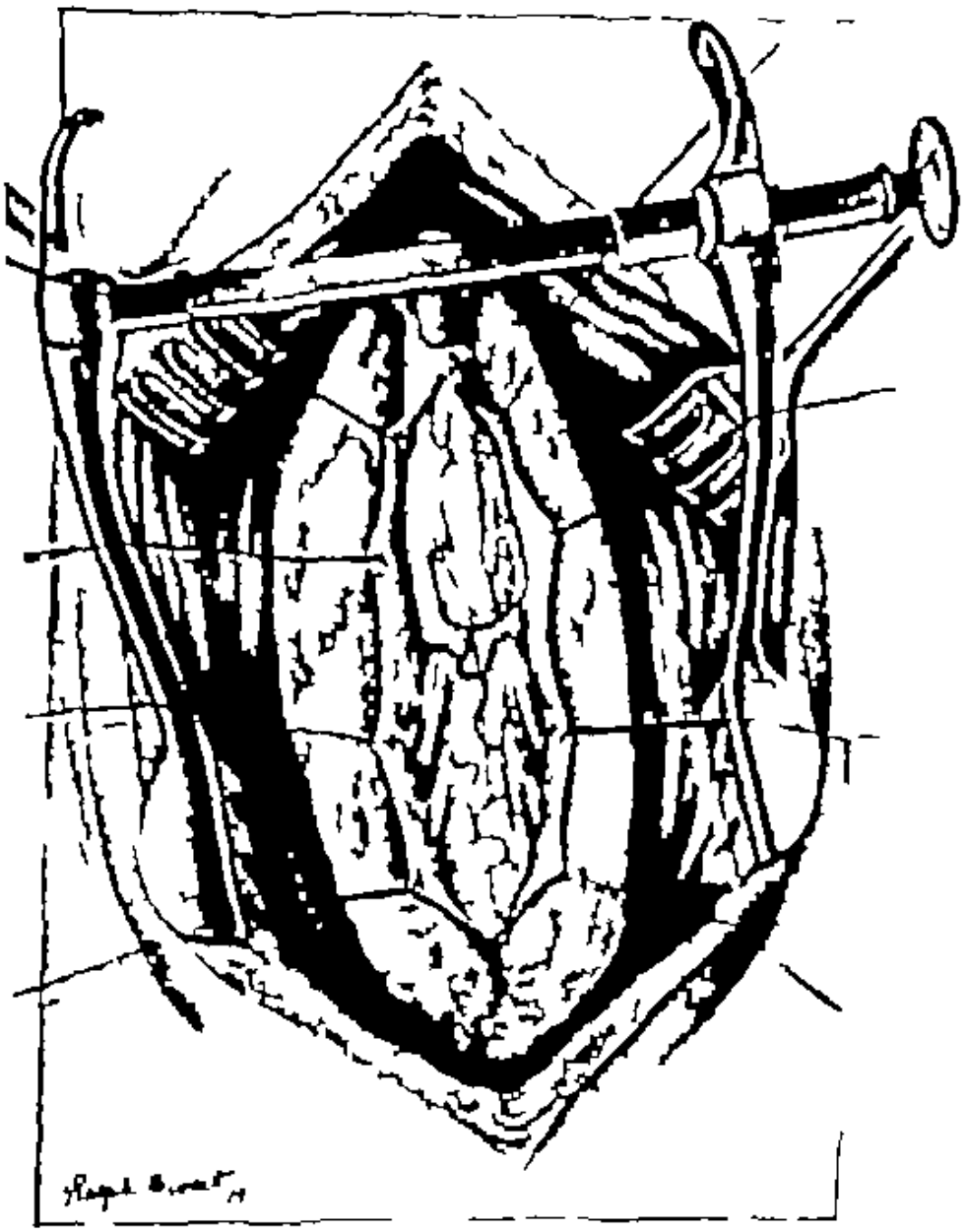

Fig. 175.—Admission No. 34,701. (See text for description of this cut.)

right lateral surface so that the cord was dislocated dorsally and to the left. After removal of the bulk of the tumor the cord still appeared prominent, and the dura over this region and

needed in routine work, nor is it advocated. Possibly even with the increasing knowledge which is being derived from it our knowledge of the normal physical variations in pressure adjustment of fluid in a manometer connected with a spinal needle at lumbar puncture alone will be increased. Also the response shown by lumbar manometer to alterations in intracranial pressure can be readily tested at will. With this accomplished and with accurate quantitative knowledge of the spinal fluid content, it may well be possible to draw deductions from lumbar puncture alone which at present we must obtain by combined cistern and lumbar puncture.

As a means of diagnosis the combined puncture has a valued place. As a means of furthering by comparative methods our knowledge of the physics and chemistry of the fluid in the lumbar region it may give us still more

Cistern puncture if not properly done is a far more dangerous procedure than lumbar puncture in the same hands. Properly done and after sufficient familiarity with the anatomy has been gained the risk is very slight. Certainly it is far less than risk of permitting the condition for which it is done to remain unrecognized or at least uncertain, or to resort to an exploratory operation.

In this clinic about 30 cistern punctures have been performed for a variety of conditions In 2 puncture was not completed owing to the fact that fluid was not obtained after it was felt that the occipito-atlantoid ligament was punctured. In all others fluid was readily obtained. There was no difficulty except that we were unsuccessful in getting fluid twice In none were there any untoward after-effects.

The work of Ayer has given us great help in a variety of spinal cord conditions and to him is due the credit for a diagnostic accomplishment that is of great value.

Of the 6 cases, the last is too recent to give the final outcome.

In the other 5 all have recovered from their paralyses. They have all regained bladder and rectal control and are all carrying on their former occupations. In 3 of them no symptoms and no neurologic findings remain to indicate any previous trouble

fourth day improvement began in the use of the right leg and a lessening of the thermic and tactile disturbance in the left leg. Patient states that there is no appreciable difference in the sensations upon comparing left leg with the right leg and face.

On the eighth day there was a slight improvement in the intrinsic hand muscles on the right, shown by weak abduction and adduction of the fingers.

Reflexes show little change from the preoperative tate.

The patient was discharged to her home at some distance and not seen later than four weeks after operation, at which time *power was still improving in the right arm and leg. The hyper*esthesia about the neck had disappeared.

The final condition of this patient is not known, although reports by letter show gradual improvement. Complete recovery is not expected and second-stage operation is contemplated, in the hope that with the cord decompression and partial tumor removal the growth will extrude further and be accessible.

Comment.—In Case VI the history as given by the patient, providing it is to be relied upon, suggests that this growth anterior to the spinal cord grew first toward the left and after a stationary period began again to enlarge and principally to the right.

The sensory changes are restricted chiefly t the lower extremities. This *finding may be well questioned but* repeated examinations failed to reveal other changes than those noted. The compression although sufficient to occlude the subarachnoid spaces as shown by the result of the combined puncture may still have been insufficient to physiologically interrupt all of the tracts below. The localized atrophies in the intrinsic hand muscles indicate of course the area f direct cord involvement.

It is in just such a case as this that the combined cistern and lumbar puncture as advocated by Ayer is of marked value.

*Differentiation of an intramedullary degenerath* process from a lesion which blocks the subarachnoid spaces is highly important finding fo both diagnosis and treatment. It is when such a question arises that the occipito-atlantoid puncture proves a decided addition to neurologic diagnosis. It is not

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# ENTEROLITHS WITH CASE REPORT

BECAUSE of the rarity of enteroliths the possibility of their presence is seldom considered in a patient suffering from intestinal obstruction. While many of the case reports show that the patients have suffered from acute or chronic intestinal obstruction statistics indicate that intestinal concretions are the rarest cause of such obstruction. Bernard[1] states that at the London Hospital during a period of thirteen years there were 669 cases of bowel obstruction, 69 of which were attributed to fecal accumulations, 15 to gall-stones while only 1 was due to an enterolith.

A review of the literature of enteroliths, however shows that while obstruction demanding prompt surgical intervention finally occurred in many cases the patients had complained of a fairly definite train of symptoms for periods of months or years before obstruction took place and that the preoperative diagnosis was seldom made the enterolith being discovered at operation or at postmortem examination.

If we exclude appendoliths which are now well known to surgeons, and the case reports of obstruction due to gall-stones, we find few records in the literature of concretions of the small and large intestine In 1901 Gant collected 50 cases to which he added 3 of his own the present review does not include any of the cases in the above report. Gant gives a synopsis of the cases in which the composition of the concretion is noted In most of the later reports little or nothing is said concerning the chemical composition of the concretion.

The classification of enteroliths has been based largely on their inorganic constituents, little attention having been given

whatever Of the other 2 one an elderly woman, uses a cane and is slightly spastic, but is about and able to perform all of her household duties the second has not been re-examined, but was walking unaided two months after operation. All of these patients but one were women. The average age was forty-one years. The duration of symptoms varied from a few months to ten years. These growths may long be present and obtain considerable size before causing any marked symptoms.

In the surgical treatment liberal resection of the area of dural attachment has been practised. These growths are not, however invariably attached to the dura. There have been no recurrences.

While laminectomy for the removal of these tumors requires attention to detail in the prevention of hemorrhage and delicate handling of intradural structures the operation presents no particular technical difficulties, and does not involve a great tax on the physical resources of the patient.

We have compared in our own series the results of a considerable number of spinal cord tumor removals with the arachnoid fibroblastomata Of all types the individuals with arachnoid fibroblastomata have shown the most brilliant results.

cellular débris. In Mr Parker's case there was a constriction in the appendix behind which was a dilated portion filled with a pultaceous material. Analysis of this by Williams[28] showed it to contain calcium soaps and a fair quantity of calcium carbonate. Williams concludes that appendoliths are due to the secretion or excretion into its lumen of material rich in calcium soaps, the fatty acid radicles of which are of the saturated type

Closely allied in chemical composition to the above is the so-called true intestinal sand case reports of which have appeared in the literature from time to time. This material appears as small semisolid particles adhering to the vessel from which the feces have been emptied It is colorless or gray to brown when mixed with small quantities of fecal material. When washed and dried it appears as small grains of sand but does not have the solid gritty feeling of the latter The larger particles look and feel like ordinary soap Chemical analysis of this material shows varying proportions of organic and inorganic constituents. In the analysis made by Williams[27] there was 55 6 per cent. of organic material and water and 44 4 per cent. of inorganic material. The total fatty acids amounted to 18 per cent. Of the total calcium present, only 34 1 per cent. was calcium phosphate the remaining 31.5 per cent he shows in his table was not combined with any inorganic acid. In Roesser's analysis (quoted by Williams[27]) he found that 10 per cent. of his specimen contained fatty substances soluble in ether

Stones found in the small intestine have been generally considered to be gall-stones largely because of their cholesterin content. There are many case reports in which a large gall stone giving rise to obstruction has been found and also others in which a gall-stone has formed the nucleus of an enterolith which has increased in size by accretion, principally by the deposition of organic matter impregnated with phosphates forming the so-called phosphatized gall-stone. In certain case reports there has been a definite history of one or more attacks of gall-stone colic with or without jaundice preceding by varying periods of time the finding of a stone in the stool or at opera-

to the organic substances which they contain. Treves[4] gives the following classification (1) Those formed in great part of phosphate of lime or of phosphate of magnesia or of the triple phosphate or stones formed of mixtures of these salts. These calculi may contain also some carbonate of lime together with soda, and are nearly always combined with a certain amount of animal matter and occasionally with a little cholesterin. They are heavy and stone-like and on section show a concentric arrangement of chalk-like or dirty white layers which often alternate with layers of a brownish color They appear to be formed around a nucleus of some indigestible substance such as vegetable fibers husks, hair fruit stones, biliary calculi, pieces of bone or other small foreign bodies that have been swallowed accidentally (2) Avenoliths "oat-stones or enteroliths of a low specific gravity and of irregular form which are porous in appearance and have the consistence of compressed sponge. They are composed mainly of densely matted together masses of vegetable fragments mixed with particles of fecal matter and with a certain amount of calcareous material similar to that in the first group (3) Concretions formed of insoluble mineral substances that have been swallowed as medicines. These are most frequently of magnesia iron, and bismuth subnitrate

More recent analyses of enteroliths in which special study has been made of their organic constituents show that they are similar in chemical composition t ppendoliths and true intestinal sand, and it is from a comparative study of these that some interesting data have been obtained which throw light on their probable mode of origin.

Appendoliths ha e long been considered to be inspissated fecal masses but recent tudy f their chemical composition shows that these small concretions are undoubtedly formed in the lumen of the appendix itself by the successive deposition of layers of material formed by the mucous membrane Microscopic examination of the appendices containing concretions shows atrophy of the mucosa and submucosa with varying degrees of fibrosis of the submucosa nd subserosa without leukocytic infiltration, the lumen usually contains considerable

a nucleus probably of degenerated epithelium. The whole mass was soft and friable and had a soapy feel and appearance. The dried material contained 33 per cent. of calcium 25 6 per cent. of neutral fat, and 7 7 per cent. of combined fat, with a fair amount of phosphate and oxalate and traces of other inorganic salts. In a third case reported by the same writer the patient suffering from mucous colitis passed a number of concretions per rectum over a period of some months. These were oval in form averaged 1 inch in length and consisted almost entirely of neutral fat. The patient had not previously taken any oil or fat in excessive quantity and the fat in the concretion was saturated. On administration of olive and cod-liver oil (unsaturated) the concretions ceased to appear the mucus disappeared from the stools and the patient gained 20 pounds in weight in three months with relief of all symptoms.

We have observed similar material filling the rectum of a patient with a colostomy performed three years and ten months previously for a supposed carcinoma of the uterus involving the rectum and giving rise to an obstruction She presented herself at the clinic with the request that the artificial anus be closed. Rectal examination showed the bowel distal to the colostomy opening to be filled with a mass the color and consistency of putty It had a distinct soapy feeling and was thought to be the contents of a dermoid cyst that had perforated into the bowel. The hospital record shows that the bowel distal to the colostomy opening had been cleansed by irrigation before the patient had left the hospital and as none of the contents of the bowel above the abdominal opening could enter the rectum, this material must therefore have been the product of secretory or excretory activity of the rectal mucosa with degenerated desquamated epithelial débris. Operation revealed a bicornuate uterus with many fibrous adhesions. After closure of the colostomy opening the normal function of the bowel was restored

Schmidt[26] states that the intestinal mucosa excretes inorganic salts such as those of iron, calcium, and phosphoric acid and also fatty substances. Hermann[27] isolated a loop of gut, joining its ends together so that a continuous ring was formed

tion. In cases in which a stone in the small bowel has given rise to obstruction and laparotomy has been performed little is said as to the condition of the gall bladder whether or not there were adhesions of this viscus to the duodenum, indicating a fistulous communication. Even a temporary fistulous communication should leave a legacy of fibrous adhesions. If no evidence of such communication was found it has been taken for granted that the stone had passed into the duodenum by way of the common duct, and that it had gradually increased in size by accretion during its stay in the bowel until it became large enough to cause obstruction. Most of these calculi have been fairly large yet a smaller stone by inducing enterospasm has caused obstruction. In the absence of a fistulous opening of the gall-bladder into the duodenum it hardly seems possible that a stone small enough to pass the ampulla would remain in the intestine for the narrowest portion of the lumen of the intestinal tract, namely the ileocecal valve is many times larger than that of the ampulla. There is evidence to show that some of these so-called phosphatized gall-stones are formed in the lumen of the intestine and are wholly independent of a gall-stone nucleus.

In Mr Paul's[39] case of acute intestinal obstruction a stone the size of a small Tangerine orange was found in the upper part of the jejunum Examination of this by Williams showed the nucleus to consist of a raisin, around which was a pultaceous mass held together by a stroma of vegetable matter Chemical analysis showed it to contain 31 4 per cent. of fat of which 74 per cent. was present as combined fat, having the low iodin content of 18 per cent. The unsaponified material was isolated and proved to be cholesterin. This indicates very definitely that the enterolith had its origin in the bowel and was not a phosphatized gall-stone although it contained cholesterin In a second case reported by Williams an enterolith causing partial obstruction was found in the lumen of the small intestine at the lower end of about 10 inches of hypertrophied gut, which was firmly contracted around it. This concretion was about 4 inches in diameter round white concentrically laminated with

This is borne out not only by their chemical composition but also by certain findings which will be mentioned later The character of the food which formed the diet of patients with enteroliths has not always been a determining factor in their origin

In considering the clinical aspects of these cases we find that most of the patients have been over thirty five years of age the youngest in the present review was a boy of twelve years (Greig[14]) the oldest a woman of eighty two years (Eliot[8]) About two-thirds of the cases occur in the female The shape of the concretion is usually round or oval and its surface is smoothly polished by peristaltic action Enteroliths vary in size from that of a cherry stone to one measuring 15 4 x 12 x 10 cm (Coerr[5]) This latter concretion weighed 945 grams. They vary considerably in density Greig s specimen was globular felt solid measured 2¼ inches in circumference but weighed only 24 grains This is important from the roentgenographic standpoint Their number has varied from 1 to 59 (Gabbi[13]) their size usually being in inverse ratio to their number They occupy the lumen of the bowel and are not found in sacculi, favorite sites for fecal accumulations. They are never as large as the latter and most of them exhibit a stony hardness which is in marked contrast to the doughy consistence of fecal accumulations.

That enteroliths increase in size very slowly is evident from certain case reports In Mackenzie s[15] case which occurred in a woman of seventy years of age the concretion was irregularly cuboidal in shape and about the size of the astragulus. Its nucleus was probably a fragment of an upper central incisor swallowed sixteen years before

In Ferguson and Reuter's case[9] the patient a woman thirty years of age had been operated upon twelve years before for an abdominal tumor and was informed at the time that this had grown around and into the intestine and could not be removed The enterolith was removed from the lumen of the small bowel about 15 inches from the ileocecal valve.

The writer s case a woman of twenty-seven years had had

The continuity of the gut was then restored by suturing its two free ends. After some weeks the isolated loop was found to contain a semisolid material similar to feces in appearance consistence and chemical composition. It contained a large amount of phosphoric acid lime and iron

There have been few reports of the chemical analyses of the larger and more dense concretions found in the large bowel. Where such analyses have been made they have been qualitative yet they reveal the same constituents though obviously present in different proportions the inorganic constituents predominating

There are two theories of the mode of origin of enteroliths (1) Williams suggests that concretions are due to an excretion of the mucosa of the intestine or its appendages. It is known that the intestine eliminates the heavy metals and it is probable that calcium is excreted into the bowel. As to the presence of fatty acids he believes that the intestine is an excretory organ for waste products of fat metabolism this is not due to local disease but is the outcome of a general metabolic disorder which throws upon the intestine or its appendages the onus of excreting deleterious products.

(2) Adami[1] suggests the following theory of the mode of their development. He states "We deal, that is, in general with the results of a catarrhal process—an inflammation—whereby in the first place there is exuded into the passage a mucinous discharge together with exfoliated cells. The disintegration of the latter affords the products of proteolysis and the fatty matters, and in such a matrix, just as in necrotic areas within the tissues there next occurs a deposit of calcareous salts through diffusion int the mass of serum f the inflammatory exudate as again of the secretion normal t the passage. There is also probably a deficiency in the amount of normal secretion leading to increased dryness f the feces nd constipation so commonly associated with the formation f these concretions.

Enteroliths therefore are not mere fecal accumulations but the result of some abnormal process of the intestinal mucosa.

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The writer's case a woman of twenty-seven years had had

an appendectomy performed nine years previous to the removal of the concretion from the sigmoid. At the time she was told that she had a cyst of the left ovary the size of a small orange though this organ was subsequently seen to be of normal size.

While it is thus seen that enteroliths may take years to develop before they attain sufficient size to cause obstruction, they do not necessarily remain dormant. In many cases, however the onset of symptoms is so insidious and their progress so slow that the patient seeks relief only when obstruction supervenes, yet a careful anamnesis reveals the fact that the clinical pictures correspond fairly well in all cases. That many of the symptoms are caused by the presence of the concretion and are not attributable to the condition of the intestine to which they owe their origin is shown by the fact that with the spontaneous *evacuation* or *operative removal of the stone* practically all symptoms disappear

Persistent constipation is common to all even the young Following this after varying periods, digestive disturbances as anorexia, nausea, vomiting flatulence meteorism, long-continued colics occasional attacks of diarrhea general abdominal soreness or local sensitiveness to pressure and actual pain exaggerated by the taking of food, are frequent complaints. Blood mucus, or even pus may be observed in the motions. The patient may discover an enterolith in the stool, and subsequently pass a number of them with relief of all symptoms.

As the concretion increases in size by accretion it may act as a ball-valve giving rise to intermittent obstruction or by inducing enterospasm or becoming wedged at a flexure may cause an acute obstruction demanding prompt surgical relief as many case reports show If the enterolith arises in the small bowel the most common site of obstruction is the lower ileum as it ascends from the pelvis. In Anderson's case two stones were present, the larger of which was fixed in the ileocecal valve the other being free in the lower ileum. If situated in the large bowel it may be passed on by peristaltic action to the rectum and evacuated with or without discomfort, or remain above the sphincter and cause pain, a feeling of weight and

tenesmus with passage of blood and mucus In the large bowel the cecum or flexures are favorite sites of arrest. Temperature, pulse and respiration remain normal unless some complication arises. A study of the literature bears out Treves statement that the most important symptoms indicative of the presence of enteroliths are those of persisting incomplete and inert obstruction of the bowel which may continue for years

Physical examination often reveals a hard, palpable freely movable mass with local tenderness to pressure The mass has been discovered by the patient whose attention has been directed to it by local soreness or actual pain. Similar findings may be obtained by palpation per rectum or vaginam. Because of its free movement within a dilated portion of the bowel the elusive concretion may be found at one examination, missed on several subsequent ones and finally appears at a later examination. The laboratory findings where stated have usually been negative

As many of the recorded cases came to operation because of acute obstruction no Roentgen-ray examinations were made In those with chronic obstruction, mention of such examination is made in but a few cases

In the present review x ray study made or confirmed the diagnosis in the cases of Anderson, Pfahler and Stamm,[*] and LeWald (quoted by Pfahler) As the enterolith lies within the lumen of the bowel and not within a diverticulum it is apt to be missed in a routine gastro-intestinal series for the opaque material flowing about it will render it invisible. If the enterolith is of sufficient density examination by the fluoroscopic or radiographic method made before the administration of barium or bismuth will demonstrate its presence If the density of the concretion is not sufficient it is quite apt to be missed before the administration or during the passage of the opaque material but may appear at a later examination for the reason that it is coated with a layer of the opaque material When situated in the colon and its presence can be demonstrated before the administration of barium an opaque enema will reveal its position within the lumen of the bowel and not in a sacculus, a

common site for fecal accumulation, and the segment of the bowel containing the concretion has invariably been found symmetrically dilated for varying distances. The dilated portion is fusiform and its walls hypertrophied which is in marked contrast to the atonic condition of the bowel in the simple fecal accumulation. The gradual increase in size of the concretion makes possible the gradual adaptation of the bowel wall to this unusual object and permits the passage of the more fluid contents about the enterolith. When the concretion is carried into the distal narrower portion of the fusiform enlargement obstructive symptoms manifest themselves. It may now either drop back into the dilated portion when there is rapid relief of all symptoms or induce enterospasm or become wedged and cause an acute obstruction. Pressure necrosis ulceration, perforation, or gangrene may follow Congestion and ulceration give rise to diarrhea mucus blood or even pus in the stools. Inflammatory changes in the bowel wall, extending to surrounding viscera mats them together producing palpable mass, which, because of the findings in the stool examination and the cachexia sometimes seen in these patients, is mistaken for malignancy In Machardy's case[17] ulceration and adhesions necessitated the resection of 13 inches of the lower ileum while in the case reported by Greig [14] intestinal obstruction caused by an enterolith, was spontaneously cured by its evacuation through an umbilical fistula.

Case Report.—E. T a graduate nurse age twenty-seven years, was admitted to Stanford University Hospital January 14 1921 complaining of general abdominal sensitiveness most marked in the epigastrium and left hypogastrium which had been present though varying in intensity since November 1920

Past history elicited the fact that she had had stomach trouble as long as she could remember As child she frequently had regurgitation, her appetit has always been poor and she has suffered from constipation.

In 1911 she suffered from colicky pains in the abdomen, flatulence with marked borborygmus and abdominal distention This seemed to be most marked after the principal meal t

noon. At this time she had occasional attacks of diarrhea. In 1912 an appendectomy was performed, after which she had considerable relief for a period of six months The abdominal distress gradually disappeared the bowels became more regular and she gained in weight. This improvement she now attributes to a carefully selected diet. At the time of the appendectomy she was told that she had an ovarian cyst the size of an orange. After this brief period of relief constipation and gaseous distention recurred and within one year all of her former symptoms had returned and she lost 40 pounds in weight. She now suffered from indigestion, acid regurgitation, and pyrosis which usually appeared about one hour after the noon and evening meals. She also had frequent headaches. By being extremely careful with her diet she managed to get along fairly well until 1914 Indigestion now became worse in spite of any dietary treatment epigastric sensitiveness appeared and there was soreness in the back between the shoulder blades. The diagnosis of duodenal ulcer was made and a posterior gastroenterostomy was performed with a Murphy button which she passed after a period of forty nine days. She was again relieved for about a year during which time she regained her normal weight.

In 1917 she entered Lane Hospital as a pupil nurse During her training she stuck rigidly to her diet, for she noticed that any deviation from this gave rise to abdominal distress and flatulence She could not eat fruit, cereals or soups. Her diet consisted of meat (except pork) toast, vegetables milk and cream, which she took in small amounts. Her appetite was fair she often became hungry between meals but hunger was relieved by a small quantity of milk. If she ate a regular meal she felt distended had acid regurgitation, and flatulence Constipation became more marked and the stools were often dry and hard.

In 1920 she graduated, and in October of that year went on night duty Her hours on duty increased the time of her meals became irregular epigastric sensitiveness returned and with this soreness in the back between the shoulder blades reap-

peared Her appetite became poor she lost weight, and suffered from recurring attacks of colicky abdominal pain vomiting and gaseous distention, and constipation became more marked. These attacks were usually followed by several liquid bowel movements and the passage of a large amount of gas, after which she felt much relieved

During her stay in the hospital her temperature pulse and respiration were normal, save for a moderate rise in pulse-rate during the attacks of abdominal colic. On admission to the hospital she weighed 117 pounds. She was given a modified Sippy diet, which did not influence the recurrence of abdominal distress. Stomach lavage and flaxseed poultices to the abdomen did not help her Enemas gave her relief and were always *followed by the expulsion of considerable gas*

*Physical examination* except for slight general abdominal sensitiveness to pressure and a palpable hard, tender freely movable mass about the size of a small orange in the left lower quadrant of the abdomen, immediately above Poupart s liga ment was negati ve That the mass was freely movable was shown by the fact that while on several examinations it could not be f lt through the bdominal wall it was easily felt by rectal palpation in the lower portion of the pelvis. Laboratory findings, including examination of the blood urine stomach contents, tools and the Wassermann reaction were negative

*Roentgen-ray Exami tion* (January 19 1921) — Fluoroscopically the heart and lungs were negative. Barium entered the stomach without delay at the cardia and promptly began to leave the stomach through the stoma. Later considerable amount of barium left the stomach through the pylorus. The stomach was in normal position and showed fair tone Peristalsis was vigorous but not abnormally so. There was point of tenderness just t the right of the duodenal cap \ defects were made out in the stomach or duodenum At si hours there was a very mall amount f barium remaining in the antrum and also in the duodenal cap. The head of the meal was in the ascending colon The ileum and cecum ppeared normal At twenty-four hours barium was scattered through

the colon. The splenic flexure was extremely high and filled with gas.

*Conclusion.*—The stasis in the duodenum without visible defect suggests adhesions in that region. There is no *x* ray evidence of recurrence of ulcer

During the examination the barium flowed around the enterolith and rendered it invisible. As symptoms of intermittent obstruction continued a second Roentgen ray examination was made February 5 1921 This revealed a large rounded shadow in the pelvis loosely connected with another mass of about the same size in the left hypogastrium The upper mass was quite tender to pressure but freely movable No connection could be demonstrated between this mass and the stomach small intestine or colon as far as the sigmoid At twenty four hours the barium extended from the ascending colon to the sigmoid, the mass in the abdomen seemed to be about the same size The shadow of the mass in the abdomen and that in the pelvis was very much denser than at the last examination, indicating that they had been coated by the opaque material.

Fecal accumulation in the rectum and sigmoid After cathartic and cleansing enemata an opaque enema was given February 15 1921 Before the enema there was one fairly large opaque mass in the pelvis nearly spheric in shape and measuring 6 or 8 cm. in diameter palpable and tender The barium ran rapidly up the rectum and lower sigmoid, which showed good tone. It left the mass and gradually extended into the upper sigmoid, which was considerably dilated. The descending colon showed good tone The rest of the colon was not filled out. The opaque mass was still considered to be a fecal accumulation.

As the patient continued to have symptoms of intermittent obstruction, operation was performed February 21 1921 The abdomen was opened through a lower midline incision.

Examination of the pelvic organs showed them to be normal. Within the lumen of the sigmoid there was a large hard round mass which could be displaced freely upward to a point about 2 inches from the junction of the sigmoid and descending colon

Fig 177 —Enterolith removed from sigmoid. Measured 3 2½ inches and weighed 45 grams. Dried surface appears rough, it having lost some of its peripheral coating

Fig. 178 —Radiogram of enterolith in sigmoid with smaller shadow of barium paste

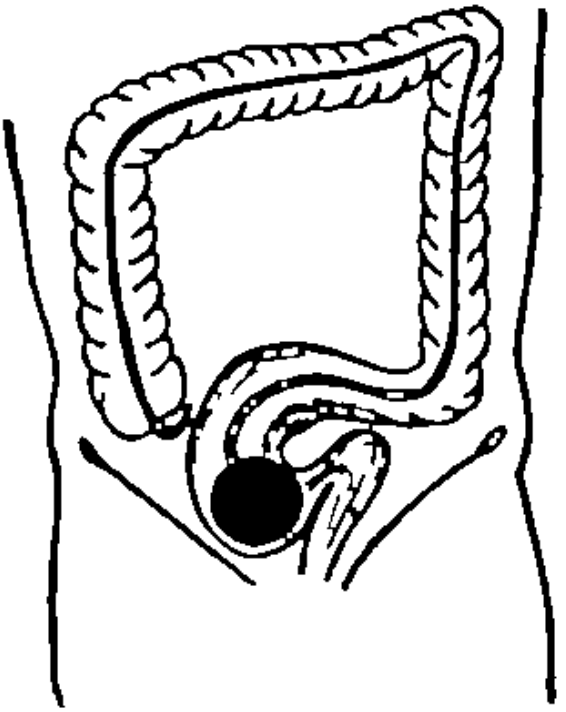

Fig 179.—Drawing to show position of enterolith in the sigmoid and its ball-valve action in the dilated and hypertrophied bowel

Fig 180.—Enterolith in large bowel observed in routine radiographic examination of kidneys. This was later evacuated spontaneously

and downward to within about the same distance from the rectosigmoid junction. There was a fusiform dilatation of the sigmoid its largest central portion being about three times the normal diameter and its walls were hypertrophied. When the enterolith dropped down into the dilated curve of the sigmoid it could be seen to exert definite traction on the rectosigmoid junction. The mechanism of the obstruction could be easily determined The enterolith acted as a ball-valve. As it was carried toward the rectosigmoid junction it occluded the lumen of the bowel and obstructive symptoms appeared. When it dropped back into the dilated curve of the sigmoid relief came with the expulsion of gas and fecal material. As the concretion could not be displaced downward int the rectum it was removed through a transverse incision through the upper portion of the sigmoid opposite the mesosigmoid. The patient made an uneventful recovery and there was a rapid disappearance of all her symptoms. At present she is enjoying excellent health and is engaged in her profession. She weighs 128 pounds and her diet is much more liberal than at any time since her first operation.

The enterolith was nearly spheric in shape of stony hardness, its surface smooth and it measured 3 x 2¼ inches. It weighed 45 grams. The sawn surface was equally dense throughout its central portion was of a dark greenish color while the periphery was laminated with alternate layers of dark green and dirty gray material.

Chemical analysis of this by Mr F A Cajori, of the Department of Chemistry showed the following composition

| | |
|---|---|
| Fat and free fatty acids less than | 1 0 per cent. |
| Cholesterol | 0 8 |
| Fatty acids from soaps | 16 7 |
| Calculated as calcium stearat | 17 9 |
| Ash | 34 3 |

Analysis of ash

| | |
|---|---|
| CaO | 12 3 per cent |
| MgO | 15 5 |
| $P_2O_5$ | 6 5 |

Qualitative tests for carbonates, nucl

A few text books merely mention the subject of enteroliths. The only review found was that by Gant. The isolated reports are few and are mostly short and meager with the result that when confronted with a case we are not alert as to the possibility of the presence of the enterolith.

Since finding the concretion in the above case we have observed another during the routine Roentgen ray examination of the kidneys. It was round, fairly dense and clearly defined in 8 radiograms The patient had not had a barium meal or an opaque enema. Later radiographic examination showed it to be absent.

While the clinical history and physical findings are in most cases suggestive the diagnosis is made chiefly by Roentgen ray examination.

As has been said before the review of case reports amply confirms Treves statement that the most important symptoms indicative of the presence of enteroliths are those of persisting incomplete, and inert obstruction of the bowel which may continue for years. This is well exemplified in the present case report. The finding of a hard, freely movable and often tender mass, palpable through the abdominal wall or per vaginam or rectum is also suggestive but this has been mistaken for an ovarian cyst or movable kidney

Radiographic examination should be made before the barium meal or opaque enema is given. As most of the enteroliths are sufficiently dense, they will appear in the roentgenogram. If the opaque material is given before radiographic examination the concretion may be rendered invisible and is therefore likely to be missed.

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## CLINIC OF DR. THOMAS W. HUNTINGTON

### University of California Hospital

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## THE RADICAL TREATMENT OF CARBUNCLE

Carbuncle has for ages been recognized as a menace and a nemesis. If undisturbed, multiple lesions of similar character either locally or at remote points, are of frequent occurrence. Recurrences are explained either by contiguity or through the blood-stream or the lymphatics. Many fatalities and a vast amount of human suffering have been hereby entailed.

The clinical history of the disease is briefly as follows. Its inception is in a small focus of infection beneath the true skin. This exists as an indurated, shot like sensitive point whose presence is first manifested by itching and later by a stinging sensation. After a brief interval the area becomes slightly elevated and painful especially at night. There is a varying temperature, and the patient complains of unrest and general malaise. A slight chill is not infrequent. Suppuration occurs centrally at an early period. The indurated area enlarges rapidly and all symptoms are exaggerated. At the end of one or two weeks the fluid content finds exit through a small skin perforation, which exudes a few drops of serum and later a small amount of pus. If still neglected the outlet becomes multiple, each perforation draining inefficiently a separate reservoir. Meanwhile adjacent tissue becomes involved more or less widely; natural barriers are obliterated, and general conditions become menacing. Pain is constant and excruciating; sleep is disturbed and systemic involvement results. As a consequence there is entailed a very considerable loss of time and earning power dependent upon method of treatment and the patient's resistance.

In the early ages sufferers from carbuncles were the victims of procrastination and ignorance. Later surgical treatment has run the gamut of poultices, with their slimy nastiness, of multi-

ple puncture of larger or crucial incisions curetment, and finally of vaccines all of which are dependent ultimately upon the suppurative process to eliminate a formidable infectious residue, to be followed by protracted healing by granulation. Meanwhile secondary foci appear with a repetition of foregoing experiences. In my opinion none of these procedures is scientifically defensible

In this paper attention is called to a plan of campaign which is simple safe and radical and affords complete protection from secondary involvement. The method is specially adapted to early cases before the central pool of pus has found exit. Under this plan a hospital residence is unnecessary as the operation can be done without embarrassment in any modern office. A

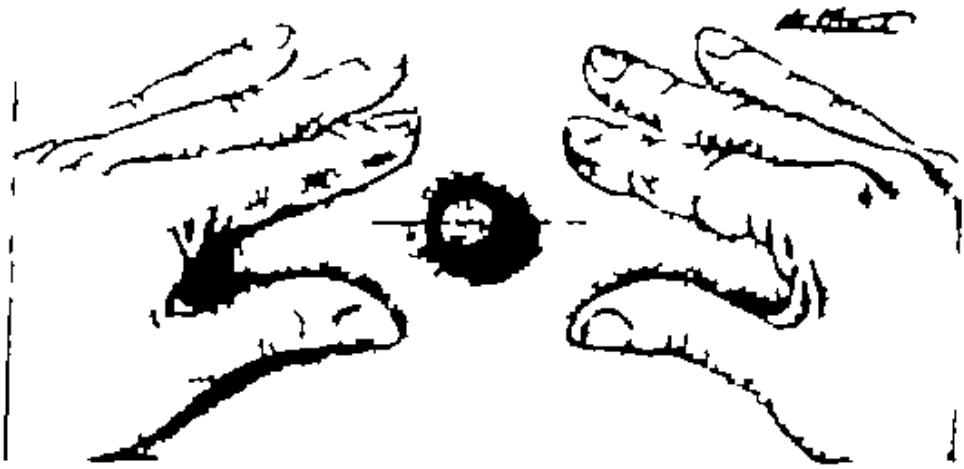

Fig 181 —Hands of assistant applying compression for hemostasis. Dotted line shows extent of incision

liberal supply of trichloracetic acid should be provided and 15 grains placed in a watch-glass are liquefied by adding a few drops of water A dozen or more toothpick applicators wrapped with cotton are provided and a local anesthetic is administered The office nurse then grasps with both hands the adjacent skin on opposite sides of the mass. Firm pressure will adequately control hemorrhage and render the entire operation bloodless.

With a sharp scalpel the surgeon makes a rather liberal incision over the convexity of the mass, care being exercised not to penetrate underlying infected tissue The skin is then deflected from the area and the tumor is isolated and extirpated

by a free dissection through healthy tissue. While the blood-supply is under control the wound cavity is freely swabbed with trichloracetic acid until its entire surface is heavily incrusted. On removing pressure one or more bleeding points may appear These are again and again treated until the surface is dry A light pack of gauze tape is introduced a small protective dressing is applied, and the patient is instructed to return in two to four days for observation. Meanwhile he is allowed to resume his usual occupation. The packing is not removed until it is loosened by exudate. The incrustation will extrude at the end of a week, leaving a healthy granulating surface The wound margins can then be approximated with adhesive plaster and prompt healing follows The resultant scar is negligible Following this procedure there is absence of pain and other symptoms. Section of the specimen will disclose a small purulent focus centrally which has existed thus far within its protective barrier

Later and graver cases associated with extensive suppuration and undermining of tissues are treated in a similar way A circumscribing incision is necessary following as nearly as possible the normal skin margin. A very wide dissection is made and the entire mass is removed *en bloc* It is essential that all indurated infected tissue be eliminated and to this end all burrowing cavities should be included. All bleeding vessels should be ligated and the entire wound area should be carefully inspected to the end that fragmentary infected foci may be removed. In this class of cases it has been my practice to swab the resulting cavity with pure carbolic acid and alcohol or camphor-phenol. The wound is then packed with gauze. Frequent dressings are necessary during the first week. For this type of cases a well-appointed operating room and hospital care are essential. By this procedure weeks sometimes months, of time are saved convalescence is rapid and in the absence of grave systemic involvement more serious consequences are inhibited.

This departure from routine practice marks a well-defined advance in surgical procedure

## CLINIC OF DR. LEONARD W. ELY

STANFORD UNIVERSITY HOSPITAL

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# CHRONIC ARTHRITIS OF THE KNEE

HERE are 2 patients who have come to the clinic on account of pain in the knee. As they lie on their tables each covered with a sheet, you observe through the window in the sheet of each that the knee is swollen. Other than this you observe nothing at all. There is no redness, no external evidence of inflammation. Remember this well. A swollen joint is simply a swollen joint and tells nothing except that there has been injury or disease in that locality. By palpation and by manipulation we shall bring out other salient points but, as you will see, while we can go a long way in making a pathologic diagnosis by a clinical examination, in the last analysis when it comes to the etiology of the disease we shall depend less upon the local examination of the joint than upon the history of the case (*what the patient tells us*). Let us remove the covering from the patients and for convenience let us call the patient upon your left A and the patient on your right B.

Patient A is a clerk, thirty-one years old, married with 2 children. He gives a history of general previous health. He had the usual diseases of childhood, typhoid ten years ago and pneumonia twice, once five years ago and once two years ago. He denies venereal history. His mother is alive and well; his father died of unknown disease when the patient was very young. Four brothers and sisters alive and well; one died in childhood of meningitis, and one at the age of twenty of 'pneumonia' after an illness of six months.

One year ago, without known cause, the right knee began to be painful and stiff. The onset was very gradual and the

patient is unable to say exactly the date of onset. The pain and the stiffness have slowly grown worse, not with a steady progression but more or less by fits and starts. They have been aggravated on several occasions by slight strains. Generally the pain is made worse by use, and in the past has subsided when the joint was at rest but recently it has been more or less constant. The patient thinks he has lost some weight, but is not conscious of having had any fever Parenthetically it may be remarked that his temperature yesterday evening was 99.5° F., and this morning it was 98 4 F No history can be obtained of any sore throat since childhood or of any particular trouble with the teeth. No other joint has been involved at any time

You have already noted the swelling of the knee. Please observe also that the joint is in semiflexion, that the patient walks upon the ball of the foot limps, and seems to walk very carefully as if something hurt him. The atrophy f the thigh and calf are perceptible to the naked eye and this atrophy accentuates the appearance of swelling in the knee

I shall ask two or three of you to place your hand first on the left knee and then on the right. What do you feel?

Answer The right knee is warmer than the left.

That is correct. The difference is quite perceptible Now if you will palpate the knee, you will perceive a thickening of the tissues but you will be unable to say whether this thickening is altogether in the soft parts, or whether some f it is bony The soft tissues ha e a sort of boggy feel and the synovial membrane is sensitive where it can be reached by the examining finger The swelling is practically all proximal to the joint line and n fluid can be demonstrated in the joint the patella does not dance and it moves but slightly from side to side upon the condyles of the femur In ther words it is dherent t them

When you look at the limb from the side you notice that the knee is flexed t an angle of about 40 degrees, and that it cannot be xtended beyond that Flexion is also decidedly limited The joint has a range f motion of about 30 degrees,

and any attempt to force the range causes pain and muscular spasm.

Taking into account the pain the swelling the increase of temperature the sensitiveness, and above all the interference with function we are now able to diagnose an inflammation in

Fig 182.—Tuberculous knee anteroposterior view

the joint or in other words an arthritis The *x* rays I pass around show in the first place an irregularity of structure of the tibia, femur and patella in the neighborhood of the joint. The bones look as if they had been gnawed by rats. The joint interval is narrower than normal, as if the cartilages were thinned or absent and the ends of the bones are irregular and

hazy The soft parts are swollen, *but there is no evidence of any bone production at the joint line*

The symptomatology and the *x*-ray picture enable us to put this case in a great group of the arthritides caused by bacterial infection. The members of this group while they differ

Fig 183.—Tuberculous knee (Lateral view)

more or less in detail nevertheless resemble each other so strongly in their pathology and in their symptomatology that they can rarely be positively differentiated without the aid of the microscope in the laboratory Each has it peculiarities, which enable one to recognize it with a fair degree of certainty in many cases, but the identification is never positive Thus,

tuberculosis is uniarticular is slow and insidious (usually) in its onset, gives a positive constitutional reaction to old tuberculin is wont to be very painful and is prone to the formation of cold abscess. It rarely attacks the joints of the fingers. Infections from the tonsils are often multi-articular and often involve the finger joints especially the metacarpophalangeal and the proximal interphalangeal joints. Arthritis from an infection in the deep urethra may be single or multiple is found most often in the lower extremity frequently in the feet, and is sometimes accompanied by the characteristic involvement of the bone in the region of the calcaneal tubercle—the so-called gonorrheal periostitis. Parenthetically it may be remarked that a gonococcic arthritis is probably never chronic. The chronic arthritis is almost undoubtedly due to a secondary infection of the deep urethra grafted on the original gonococcic one.

Typhoid arthritis usually occurs in the late stages of typhoid fever or in convalescence may or may not be painless and affects by preference the hip or spine In the latter case it is wont to be horribly painful. I speak from experience

Syphilitic arthritis has no definite peculiarity that I have ever been able to discover It may affect any joint in the body at any age It may break down at any time or may remain closed indefinitely It may involve one joint or many and it may be painless or very painful The patient may or may not have a positive Wassermann reaction. Often one will discover by careful search the characteristic thickening of a shaft involvement, but the best way of all to differentiate is by the therapeutic test. In fact, it is a safe rule to follow never to do a radical operation on a chronic arthritis until syphilis has been ruled out by a course of antisyphilitic treatment. If you will remember this you will save yourselves from many a humiliating mistake We may even remember it, but, disregarding it occasionally have cause to rue our carelessness.

These are the chief members of this group Most of the rules for treatment can be easily deduced from the pathology and the etiology Suspected tonsils should be removed lesions

in the deep urethra should be cleaned up Syphilitic arthritis demands mercury the iodids and salvarsan. Note that this is the only form of arthritis which is really benefited by internal medication or external applications. In the other cases they are useless. If you like the odor of oil of wintergreen, rub it into the floor and you will do your patient just as much good.

In tuberculous arthritis we are forced to proceed on principles different from those applicable in the other members of the group Into all the details of the treatment of a tuberculous joint I cannot enter here but I will ask you to remember what I have taught you both in the laboratory and in the clinic, and not to depend upon the word of any man when it is in conflict with what you have seen with your own eyes. Tuberculosis in the bones when it is uncomplicated by a secondary infection, is *strictly a disease of the lymphoid marrow and of the synovial* membrane The presence of these two tissues seems to depend in some way upon function. If function be abolished, these two tissues disappear If these two tissues disappear the disease dies out. It is literally starved out. Hence the first rule of treatment—deprive the joint of function. In the adult the treatment is radical Operate with the sole idea of destroying function in the joint

In the child the treatment is practically always non operative except in disease of the spine In Pott s disease do an ankylosing operation, the Albee or better yet, if you will take *the time and pains to master its difficult technic* the Hibbs operation In all other joints continue your conservative measures until all hope of saving the limb is gone Then amputate to save life Resist stoutly the wiles of those who would have you resect tuberculous joints in children I cannot denounce the procedure in terms too strong

To which member of the group then does *this* case belong? No other joint has been involved examination of the deep urethra fails to reveal any evidence of infection, and the joint is steadily growing worse This persistence and progression in one joint points against the tonsil. Again, in an arthritis from infection in the tonsil the bone damage is rarely as extensive as the

x rays show here Most of the damage in "tonsillar" joints is in the soft parts. The family history and the personal history point strongly toward tuberculosis. Syphilis remains. We shall have a Wassermann test done and whether it be positive or negative we shall prescribe a few weeks course of antisyphilitic treatment. If at the end of that time a decided improvement has not taken place we shall urge a resection. If we do a resection we shall do it with only one idea in mind and that is the destruction of the joint. We shall not bother to dissect out the synovial membrane or concern ourselves with the condition of the bone left behind. We shall get bare bone apposed to bare bone sew the wound up tight, and immobilize the knee until it has thoroughly stiffened Bony union itself will hardly take place before about a year

Another rule you must remember Avoid secondary infection. Do not scrape, drain, and pack these joints, but after operation close your wound up tight. When we attempt to provide by drainage for the exit of tuberculous material we actually provide for the entrance of pus germs and seal often the death warrant of our patient.

As you well know when a patient has a tuberculous joint he has also some other tuberculous focus in his body and presents a two-sided problem—a constitutional and a local side. Therefore from the start we do everything we can to improve his general condition Here, then, we have the three rules of treatment in tuberculous joint disease 1 Deprive the joint of function 2 Avoid secondary infection. 3 Improve the general condition.

Let us turn now to patient B He is sixty five years old, a railroad man by occupation, who has had pain and stiffness in his right knee for many years. Little can be learned from his past history He is married and has 4 children, all alive and well. Like the majority of patients he denies venereal history He had pneumonia once twenty five years ago and influenza during the epidemic of 1918. His left knee causes him some discomfort at times but not nearly as much as his right At times he has been troubled with sciatica and lumbago He

has not had a sore throat since he can remember but has had a great deal of trouble with his teeth. A number of them have been extracted during the past decade on account of abscesses at their roots. You observe that the few remaining teeth are in very bad condition. He attributes the pain in his knee to trauma, because he first noticed it immediately after an accident, but when we question him closely we find that he had pain in the knee before the accident occurred. Recently it has grown much worse, and often keeps him awake at night. It is always made worse by use and generally is better in dry weather. He has had a great deal of trouble with his digestion, and the symptoms in the knee are sometimes aggravated by errors in diet, so that he has learned to choose his food carefully.

On examination you see that the joint is in very slight flexion—about 20 degrees—and is swollen. In contradistinction to the last case the swelling is not only proximal to the line of the articulation between the tibia and femur in the quadriceps pouch, but about the joint line as well. The thigh and calf are possibly a trifle trophied, but the trophy is not nearly as well marked as in the previous case. The local temperature is not perceptibly raised and the swelling seems more resistant than in the other case. In other words, it seems more bony. The joint contains a small amount of fluid and the patella is not adherent to the femoral condyles but grates coarsely on them when it is moved from side to side.

When we start to move the joint we find that full extension cannot be carried out, but that the knee can be flexed without difficulty to an angle of about 110 degrees when motion comes to a sudden definite stop as if it were checked by bony obstruction. The motion is accompanied by palpable and audible grating but you notice the absence of muscular spasm so prominent in the preceding case also the sensitiveness to pressure.

Here then, we have again an arthritis of the knee but an arthritis which differs greatly in its symptomatology and in its history from the other and when we come to study the x-ray film we notice a prominent feature which we missed in the other film, namely peculiar lipping and spurring at the

margins of the joint in the region of the attachment of the capsule. This spurring and lipping sets the disease off sharply from all the known bacterial arthritides and is responsible for the many names which have been bestowed upon this form This

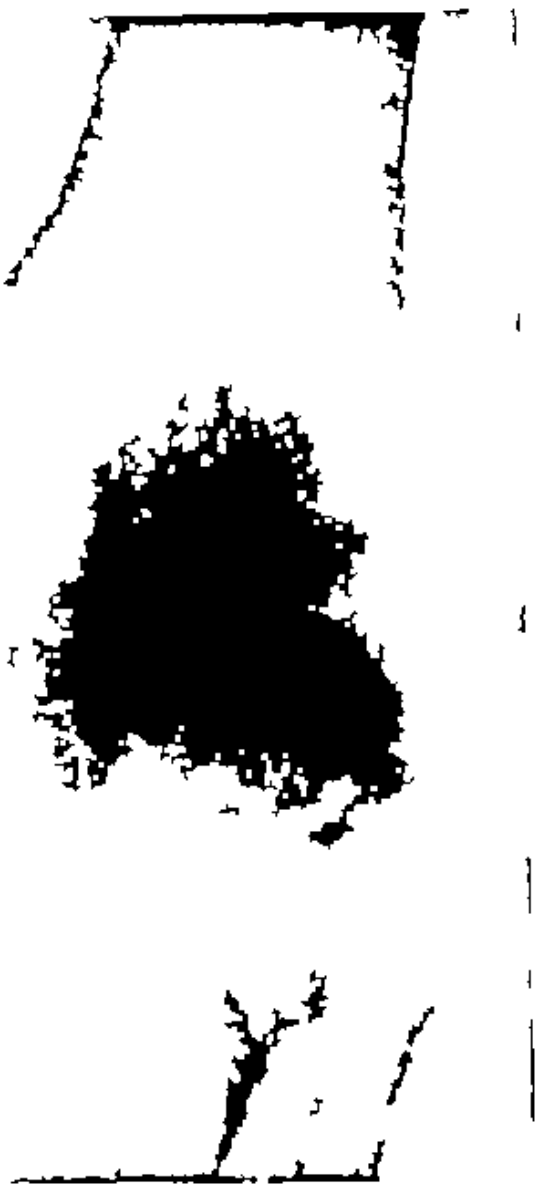

Fig 184 —Second type arthritis of knee, anteroposterior view

is the arthritis deformans of the Germans the osteoarthritis of the English the hypertrophic arthritis of Goldthwait, the degenerative arthritis of Nichols and Richardson, the metabolic arthritis of some the destructive arthritis of others. This is the chronic rheumatism of the elderly and when it occurs in the

has not had a sore throat since he can remember but has had a great deal of trouble with his teeth. A number of them have been extracted during the past decade on account of abscesses at their roots. You observe that the few remaining teeth are in very bad condition. He attributes the pain in his knee to trauma, because he first noticed it immediately after an accident, but when we question him closely we find that he had pain in the knee before the accident occurred. Recently it has grown much worse and often keeps him awake at night. It is always made worse by use and generally is better in dry weather He has had a great deal of trouble with his digestion, and the symptoms in the knee are sometimes aggravated by errors in diet, so that he has learned to choose his food carefully

On examination you see that the joint is in very slight flexion —about 20 degrees—and is swollen. In contradistinction to the last case the swelling is not only proximal to the line of the articulation between the tibia and femur in the quadriceps pouch, but about the joint line as well. The thigh and calf are possibly a trifle atrophied, but the trophy is not nearly as well marked as in the previous case The local temperature is not perceptibly raised nd the swelling seems more resistant than in the ther case. In other words it seems more bony The joint contains a small amount of fluid and the patella is not adherent to the femoral condyles, but grates coarsely on them when t is moved from side to side.

When w start to mov the joint we find that full xtension cannot be carried out, but that the knee can be flexed without difficulty to an angle of about 110 degrees when motion comes to a s dden definite top as if it were checked by bony obstruc tion. The motion is accompanied by a palpable and udible grating, but you n tice the absence of muscular spasm so prom inent in the preceding case also the sensitiveness to pressure

Here, then we have again an arthritis of the knee but an arthritis which differs greatly in its symptomatology and in its history from the other and when we come t tudy the x-ray film we notice a prominent feature which we mi-sed in the other film namely peculiar lipping and spurring t the

has been attributed to trauma and yet trauma could not possibly cause the changes which as we shall see are characteristic of this disease It is a simple thing easy of comprehension yet universally ignored that a bone cannot be injured in any way unless it is fractured. It cannot be bruised sprained or strained. Trauma is never the cause of this disease itself but is often the cause of the symptoms The x rays teach us that the changes of this type of arthritis may have made marked advances without causing any symptoms whatever but you can readily appreciate that a joint thus damaged is a poor machine and is easily sprained. As in many instances in medicine we have put the cart before the horse. The sprain does not cause the disease but the disease really causes the sprain or rather predisposes to it.

Rather a popular theory of the causation is that this form of arthritis is due to errors in metabolism to some mysterious chemicals floating in the blood. Metabolic error dyscrasia, and diathesis are rather meaningless terms with which we are wont to cloak our ignorance, and they delude us into thinking that they mean something and so stifle progress Just at present the error in metabolism is supposed to be caused by an excess of carbohydrates in the food A while ago it was an excess of proteins. There is no more pathetic delusion in the therapy of chronic arthritis than the dietary The pendulum swings back and forth.

On the other hand, diet, like trauma and mental emotion, plays a rôle and the rôle is easy to understand when we find the key to the problem They all may be regarded as contributing causes.

A theory of the causation which keeps cropping up is the infectious theory but until recently no reliable evidence in this direction ever has been adduced Not only the symptomatology of the disease but also its pathology both gross and microscopic are sharply marked off from that of those bone and joint diseases caused by bacteria, and we have been uniformly unsuccessful in our efforts to find bacteria either in the joint fluid or in the bone marrow

terminal interphalangeal joints, a favorite site It is called Heberden s nodes, and is often mistaken for gout. When it occurs in the hip it is often called morbus coxæ senilis, and different combinations of it in the hip and spine have received

Fig. 185.—Second type arthritis of knee lateral view Not ca ious in the head of the tibia.

peculiar names from those who have described them in the belief that they constituted special diseases

The cause of this form of arthritis has ne er been proved Like practically every other disease of bones and joint so this

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This form of arthritis is essentially a disease of middle and later life This is well known. It never occurs in infancy or in childhood Arthritis deformans juvenilis is a misnomer On the other hand we find that it may occur as early as the third decade of life in patients with abscesses at the roots of their teeth. This alveolar infection is almost invariably present in patients with this type of arthritis. Only about 3 of our patients more than 200 in number suffering with it had sound teeth, but, of course these 3 cases negative alveolar infection as the sole essential cause, and relegate it to a subsidiary rôle.

The whole pathology of this disease indicates that an infection of some sort is at the bottom of it. What, then, is the non-bacterial infective agent which gains access to the system through the bone at the roots of dead teeth and carried to the marrow in the region of the joints sets up an arthritis which is aggravated by trauma, errors in diet and emotional disturbance, and *never in any circumstances results in suppuration?* Presumably it is some form of organism domiciled in the gastro-intestinal tract, which, ordinarily comparatively harmless, gains access to the system through the atria at the roots of the teeth. *Errors in diet and emotional disturbances by their influence* on the digestion, would make this organism more active. All the evidence points t some form of protozoön as the culprit, and here at Stanford we are bending our energies to finding out its identity *Professor Kofoid, of the University of Calif rnia*, thinks he has found the Amœba histolytica in one of my specimens and if we can substantiate his findings we shall ha e sol ed the problem.

We *turn now* to the pathologic anatomy The bone and cartilage changes give the disease its stamp and ha e been well described by several writers, who think they are the primary and essential changes of the disease Neither in this nor in any other disease is this the fact As you have learned in our course in surgical pathology bone nd cartilage re purely passive tissues which, not capable f inflammation themselves simply react to disease in the synovial membrane and in the marrow

The primary and essential change in the second great type of arthritis is an aseptic necrosis in the marrow near the joint. The bone and marrow in a greater or smaller compass die and are replaced by fibrous tissue containing cysts and sequestra. Naturally the bone becomes rarefied, and this rarefaction and the sequestra can almost always be detected even in the x ray film, if they are sought. Now as if to wall off this necrotic mass from the joint nature builds a layer of dense bone beneath the cartilage—eburnated ivory-like bone. The cartilage becomes fibrillated tattered and calcified and then shut off from its nutrition by the dense underlying bone wears away. The exposed bone becomes polished and grooved in the line of joint motion and new bone is laid down at the periphery. This new bone constitutes the lipping the 'border exostoses, on which the diagnosis is based.

The necrotic areas themselves are painless and the patient may have the disease for a long time without knowing it but the resulting bone and cartilage changes damage the joint as a machine and it is easily sprained by a slight trauma. Hence the patient ascribes the disease to trauma. Perhaps the *arthritis* itself that is the inflammation of the synovial membrane is really traumatic.

You are now in a position to understand also why an elderly patient, by a slight twist, fractures the neck of a femur already largely necrotic, and why in such a fracture union is hard to secure. Why is it that when an elderly patient with marked alveolar infection suffers an intra-articular fracture of say the radius the wrist joint becomes the seat thereafter of a persistent arthritis? Why indeed except that he has opened up a long-standing infection in the end of the radius?

The result of the second type of arthritis is an ankylosis, a limitation of motion, caused solely by the maladjustment of the bone ends entering into the articulation. Union whether by fibrous tissue or bone never occurs, as in the first type except in the spine where the vertebral bodies may be united by a mass of bone poured out over their anterior aspect, like syrup from a jug. On the other hand damage once done is permanent, even

after the cause ceases to operate. *The joint never returns to* normal, as it does in an arthritis of the first type.

The treatment of this form of arthritis is predicated on what has been said. The first indication is to remove the focus of infection at the roots of the teeth. When the dead teeth are removed the joint often returns to a state approximating normal and the pain subsides though as the anatomic changes are permanent, it *never functions perfectly and is always liable to injury*

Recently we have been investigating the stools of these patients for amoebæ, but as yet have found the organisms in only 2 or 3 cases.

As a palliative measure heat is almost always grateful in this disease. Witness the tendency of old people with chronic rheumatism" to "hug the fire. Hydrotherapy sometimes relieves the pain, as does the Bier treatment by passive hyperæmia in the joints of the extremities. For some unknown reason the intramuscular injection of a foreign protein will benefit some cases. Drugs externally or internally are practically useless Employ them only as a last resort.

Sometimes the disease in the hip-joint is very painful. Then your best procedure is a resection, followed by immobilization in plaster of Paris in abduction for two or three months A very painful knee also should be resected.

Passive motion only does harm by grinding the roughened and distorted bone ends against each other Do not forget that there are no adhesions t break up in this type of arthritis.

Let me impress upon you in conclusion the importance of founding all your ideas of diseases of the bones and joints upon a sound knowledge of pathology To attempt to judge from inspection of the surface what is going on within is futile When you operate upon a bone or joint d not throw away the material removed, but take t t the laboratory cut it up and study it The bone-marrow rarely studied, is one of the most interesting important, changeable and complex tissues of the body and one of the earliest to respond to general infections. You cannot do better than to study it intensively and exhaustively The study will pay you well in reputation and in entertainment

# CLINIC OF DR ALANSON WEEKS

CHILDREN'S HOSPITAL, DEPARTMENT OF SURGERY UNIVERSITY OF CALIFORNIA

## CONGENITAL PYLORIC STENOSIS

PATIENT is a male baby one month old (eight months premature) He weighed 6¼ pounds at birth and now weighs 4½ pounds. He comes from the country reaching the city one hour ago As you will see he is markedly dehydrated and hardly as large as a fair-sized cat. This is the typical picture of this disease when it has been left too long before coming to surgery This baby started to vomit and to lose weight two weeks ago The vomiting at first was exactly the same as vomiting due to other causes As the tumor at the pylorus thickens and closes the lumen, the stomach gains in muscular strength by its efforts to empty itself The vomiting then becomes characteristically projectile and should be mistaken for almost nothing else especially if the child is placed in a good light and one sees the distinct wave which is made by the violent contractions of the stomach in the upper abdomen. Added to these signs, the rapid loss of weight and the change in the character of the stools even without waiting until they have become almost nothing but mucus will clinch the diagnosis. The use of bismuth and x ray we consider superfluous. We have knowledge of more than 100 of these babies operated upon here in San Francisco and only one patient failed to show the typical, hard, large pyloric tumor

Dr Botsford who has given the anesthetics for some 30 of these babies for us remarks that this is the smallest one we have yet seen. The proper giving of the anesthesia to these little patients is a very important point in connection with the operation.

We will prepare the region of the upper abdomen with 5 per cent. picric acid in alcohol which we are now using altogether as a skin antiseptic.

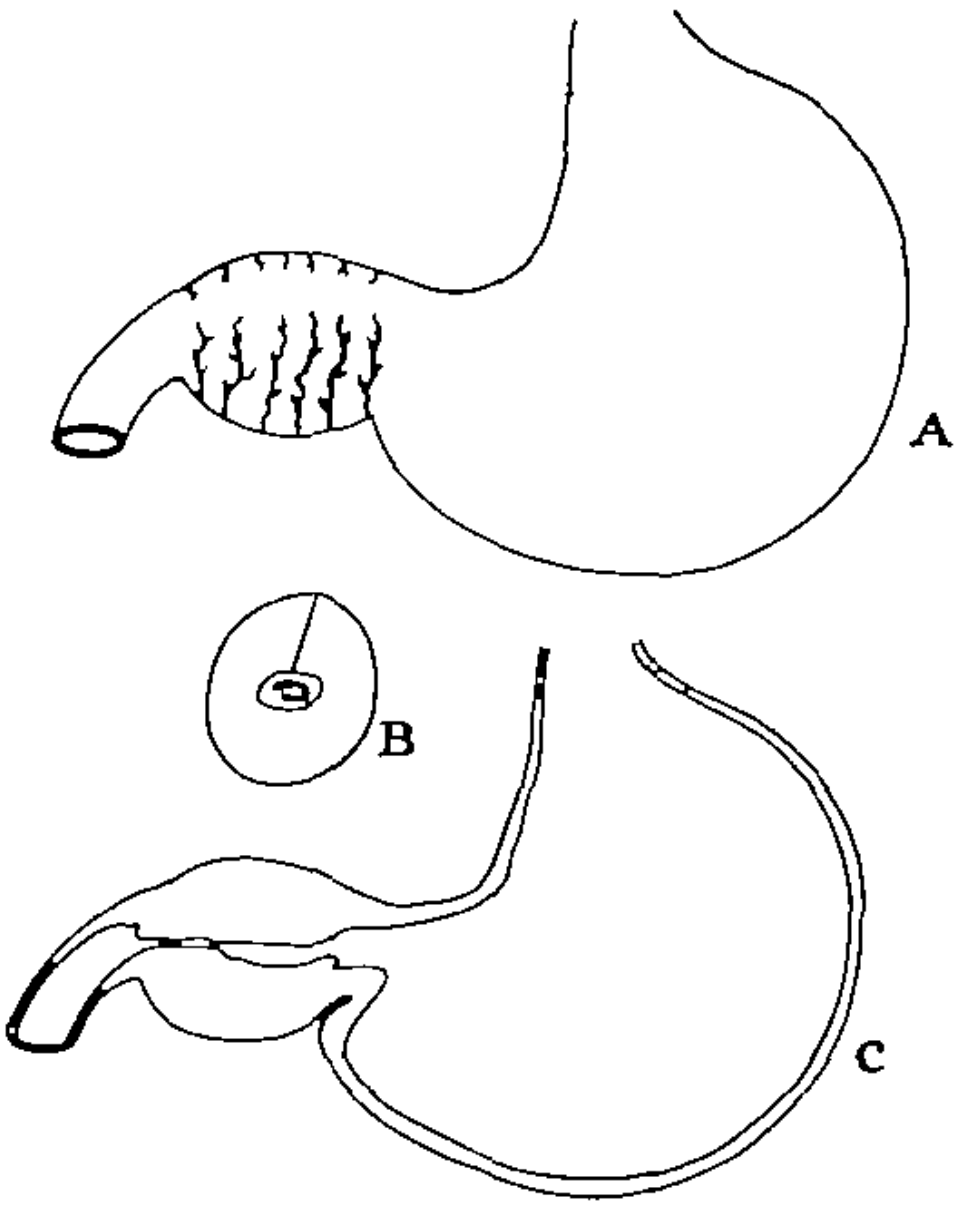


Fig. 186.—*A* Stomach with tumor at pylorus showing bloodless area. *B* Cross-section of tumor. *C* Sagittal section of stomach and tumor.

We will make the high right rectus incision which was suggested by Dr. Bevier as former assistant, because as you will see in a moment, the liver is behind this incision and protects it from a hernia and from the protrusion of the viscera. We have opened through the peritoneum and we are lifting up the edge

of the liver with the knife handle and there you can see the stomach much distended even though it was washed out thoroughly before the operation. The anesthetist will please put a

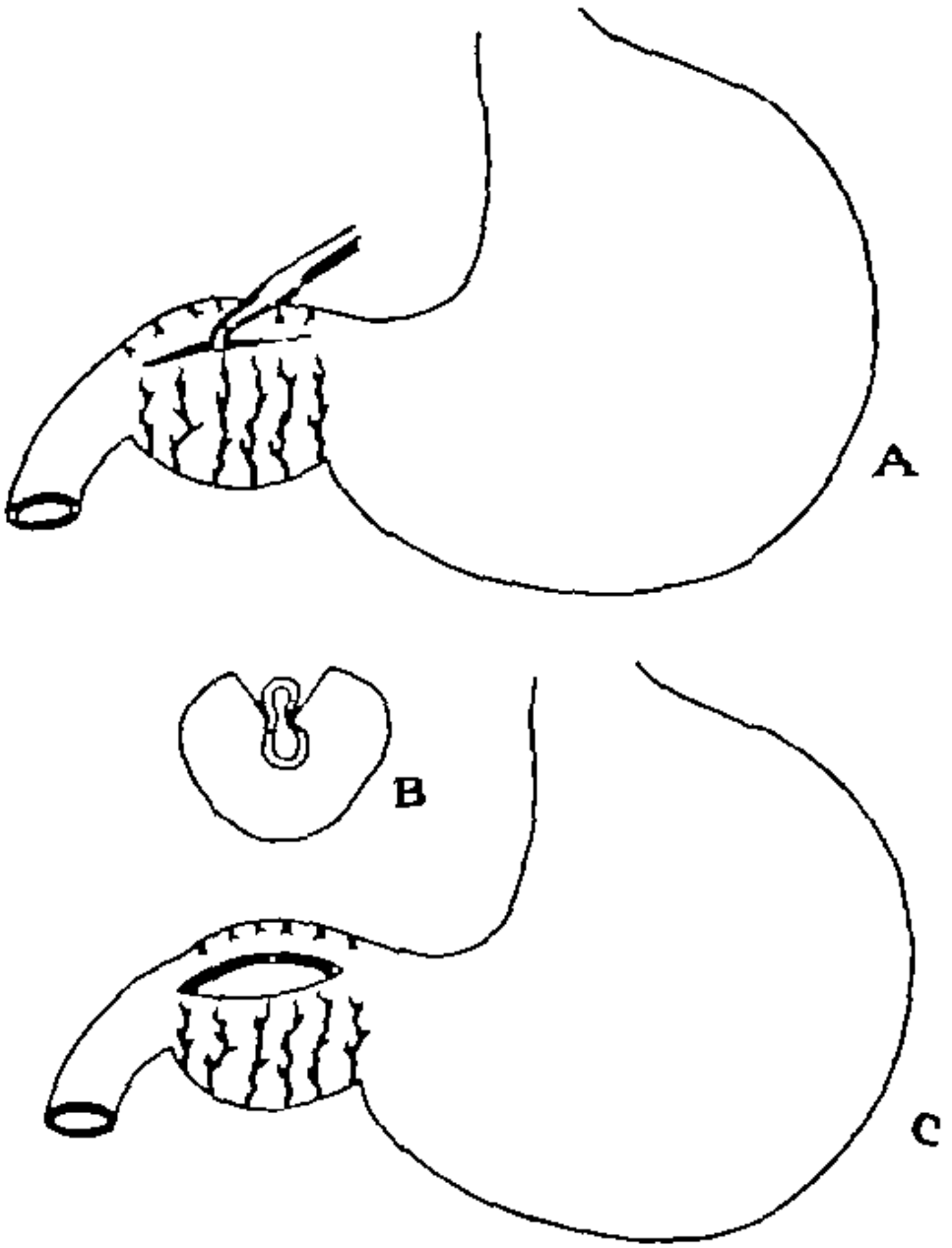


Fig. 187.—*A* Incision through bloodless area with forceps introduced. *B* Cross-section of tumor open with mucous membrane bulging. *C*, Stomach and tumor with tumor divided showing projecting mucous membrane.

catheter into the stomach and, you see the stomach collapses. In pulling the pyloric end of the stomach out you see we have delivered the tumor which is typical and of rather large size for

a baby of this age You will notice that there is a pale line along the upper and the anterior border of the pylorus. This is the area where the blood-vessels coming around from behind barely meet. It is through this bloodless area parallel to the lumen of the pylorus, that we now cut the serosa barely into the tumor tissue. We now take a pair of small, curved Kelly forceps and force them into the middle of the cut and to the middle of the tumor and as we open them you will notice that the tumor splits from end to end with great ease These tumors seem to have a grain like wood, and unless you make your cut parallel with this grain or the lumen of the tube you will be amazed to find that the tumor does not split as you naturally expect. You will notice the mucous membrane bulging up into the wound being held down here and there by a few little bands which are easily divided. As you see, the tumor has not been cut, but has been opened practically altogether by divulsion, and we are spreading the forceps carefully at each end, particularly at the duodenal end where it is so easy t open into the lumen of the bowel By opening down to the mucous membrane this way you see there is very little danger of opening the lumen. If such should happen, however one need not worry We have opened the lumen of the bowel in 3 cases and whipped it up with a few stitches of very fine catgut and all 3 of the babies in whom this happened are well today

This is all that is necessary t be done The tumor is dropped back into the abdomen, the liver falls down over the stomach, and shuts off this wound We will close the bdomen in layers, exactly as in an adult, with stay sutures of silkworm-gut over a small bolster We will now inject 20 c c of 3 per cent glucose solution under the skin of ea h axilla.

The nesthetist states that the operation from opening to closing has taken just twenty minutes.

This baby will be put t bed in an upright position and ll be given glucose solution as soon as he is conscious enough t swallow He will get the drip with the funnel method (see California Stat *Journal of Medicine March, 1922*) *immediately by* bowel, of glucose and bicarbonat which will be di-continued

after a day or two or as soon as he is taking plenty of fluids by mouth. The mother's milk will be fed to him diluted, beginning tomorrow morning and in probably three days he will be nursing the breast, the mother leaning over the bed

The second patient is a male eleven weeks old, who has vomited for less than a week. As soon as the pediatrician found that the baby was losing weight he immediately brought him for operation. You will notice that he is a fine healthy baby although he is having the markedly projectile vomiting, the mucus stools, the loss of weight, and the marked wave in the upper abdomen. One can see at once that when a baby comes in in as good condition as this one there should be absolutely no mortality following surgery

This is the twenty-eighth patient upon whom we have done this operation since the spring of 1919 We lost 2 of this number One came in with a very marked enteritis which may have been due to the thickened feeding which was tried That baby died three weeks following the operation from the enteritis which had continued.

The other baby was also one which had been left too long and was very weak, and, as many of these babies do after the operation, vomited for a few days. This baby vomited a small amount the morning after the operation, aspirated into his lungs a good deal of the fluid, and promptly died. This brings to mind an important point in the care of these little patients. One must be very careful that one has nurses who are unceasing in their vigilance, watching for just such a calamity as this, and who know enough to rapidly turn the patient on its side or even head down.

It is rather unfair to count either one of these deaths a result of operation, because we believe if they both had come to surgery when the diagnosis could have first been made and when a few days of careful medical attention did not show improvement, they could both have been saved.

I believe that there would be no mortality following this simple operation of Fredet's if the babies were brought to operation early enough.

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## MECKEL'S DIVERTICULUM

THE patient is four years old and was taken suddenly ill with cramps in the abdomen three days ago He has gone on with a perfectly typical picture of an acute appendicitis. He started with pain, cramp-like, in the abdomen, followed by nausea and vomiting and today his doctor finds him with a temperature of 101 F with localized tenderness in the right lower abdomen and with marked guarding of the muscles. The leukocytes show a count of 17,000 with 83 per cent. polys.

Our diagnosis is acute appendicitis with probable perforation We are so satisfied that this is an appendix that will probably need drainage that we are going to make the gridiron incision. We notice now that the child is thoroughly relaxed, we are able to feel a mass right under McBurney's point. As we open the peritoneum, after separating the muscles thoroughly there is a free discharge of leukocytic milk, and as the finger is worked around in the abdomen we here deliver a mass which is adherent to the anterior peritoneum. It proves to be a coil of bowel wrapped around about by the end of the omentum and as the omentum is freed it proves to be a Meckel's diverticulum perforated at its end You will notice that it is about 1 inch long and about half the diameter of the small bowel coming off at right angles with a distinct mesentery of its own. We had one other perforated Meckel's diverticulum in a child about six months ago which had a diameter fully as large as that of the small bowel but it had no mesentery whatever

I am unable to give the differential diagnosis between this condition and appendicitis which if it were possible is unnecessary as the condition is so evidently surgical In both these patients the diagnosis of appendicitis was made.

We are clamping across the base of the diverticulum and removing it with a knife, whipping over and over the forceps with fine chromic catgut, and as we remove the forceps the stitch is drawn taut and we now run a reinforcing stitch with plain cat

In connection with this operation it might be interesting to say that when we were first doing it in 1915 here in San Francisco we were calling it the Rammstedt operation. In looking over the literature we found that Dr Pierre Fredet, of Paris, had reported the operation in 1910 and he distinctly made the statement therein that it is unnecessary to do more than just split the tumor without any stitching, exactly as we are doing now we have, therefore, given his name to the operation since then.

We received a reprint of an article by Fredet read in April of 1921 in which he recommends that gastro-enterostomy is a better operation. Later our attention is called to an article which he published in October 1921 in which he again mentions that gastro-enterostomy is a good operation in the hands of experts but that he then considered his own operation of splitting the tumor an excellent one. He should be pleased to know that his operation is the only one advised by the majority of surgeons with experience in this disease in America.

The complicated but beautiful technic of Strauss is mentioned only to be condemned even though he is able t report almost the smallest mortality of any surgeon.

There is no necessity even should you puncture the mucous membrane into the lumen of the bowel to stitch the omentum over the wound as suggested by Rammstedt. The omentum will be found firmly attached to the wound within a few hours after operation in any case.

In other words, the simplest technic has been proved without question to be the best. The least possible handling of tissues of these little patients naturally is the best, and as we ha e said before with this simple procedure if these patients are brought to operation early before their vitality is wrecked by starvation, one should expect to lose none.

Postoperative Note. Both of these babies made good recoveries and are now in perfect health

# CLINIC OF DR. EDWIN I. BARTLETT

UNIVERSITY OF CALIFORNIA HOSPITAL

## A TUMOR OF THE SCAPULA

THIS patient is a healthy hard working well-developed man of thirty four His tumor first appeared six years ago as a small elevated area at the point of the right shoulder Six months previously he had had a serious trauma to this region. There had been no swelling immediately following his injury but pain and tenderness had been present for a week or two Twice since then there has been direct trauma to the tumor five years ago and five months ago respectively while there was severe wrenching of the shoulder five days ago Following each trauma there has been a definite growth in size slow but continuous after the first trauma, and rapid for the past few months. During the whole interval the patient has had some limitation of function, but not enough to prevent him from working or to impel him to seek the services of a physician. His last injury was totally incapacitating and brought him to the hospital. He now has moderate pain and quite pronounced tenderness in the tumor with nearly complete limitation of movement of the shoulder

Examination reveals a mass occupying the position of the right scapular spine and acromion process. It measures about 5 x 10 cm. It has rounded and sharply limited edges it has a firm but elastic consistency Pressure at one point gives a ping pong crepitus. A bony collar or rim is palpable at the junction of the tumor with the remaining healthy bone of the scapular spine There is pronounced atrophy of the rhomboids and trapezius, which, together with considerable soreness all over the shoulder joint, accounts for the high degree of disability

*x* Ray plates (Fig 189) show a pronounced uniform expansion of the scapular spine throughout its whole length from the base

gut. We used the same technic on the last case, which made a good recovery

Because of the perforation and the nearness to the end of the ileum, with a possibility of colon bacilli in the cavity we will place a drainage-tube to the bottom of the pelvis and will remove it in three days.

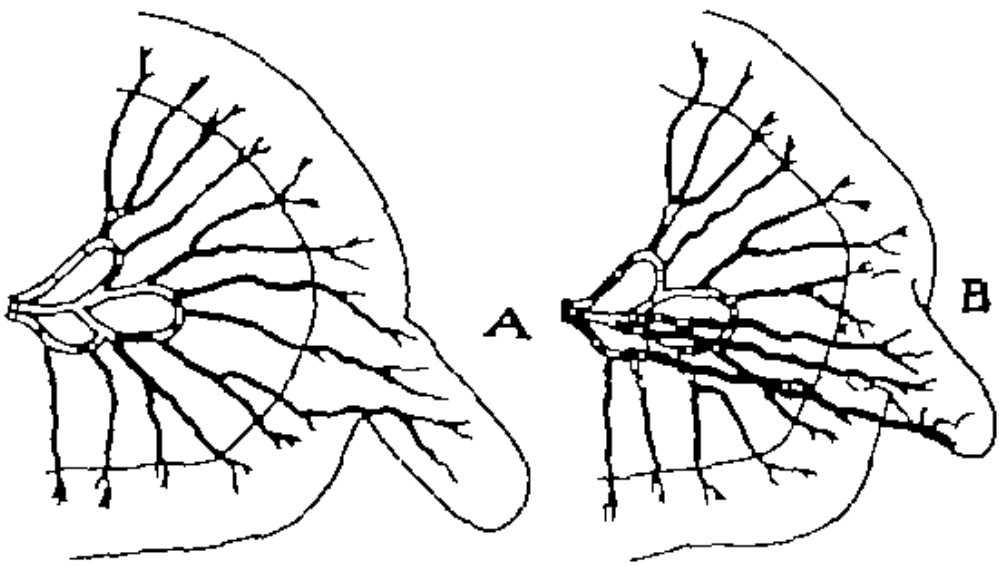


Fig. 188.—Two types of Meckel's diverticulum, both blind ended. *A* Without mesentery. *B* With its own mesentery.

Postoperative records show that this patient had a rather stormy time for two days, but with the use of the glucose and sodium bicarbonate solution constantly by bowel with the funnel method, in spite of vomiting the patient received plenty of fluid and nourishment and made a good recovery. The drainage from the wound stopped in a week or ten

sue make this condition extremely unlikely except as a recent development. Among the benign tumors bone-cyst is ruled out by the fact that this tumor developed in middle life while benign bone-cyst, according to Bloodgood's studies does not begin after twenty Myxoma is not to be considered on account of the rarity of this tumor as a central lesion outside the phalanges and the fact that erosion of the periosteum is a fairly early development in myxoma. There remain now but two possibilities giant-cell tumor and chondroma. The weight of clinical evidence is in favor of chondroma, because this is the most common new growth of the scapula and giant-cell tumor is extremely rare. Furthermore pain which is absent in this instance is an almost constant symptom of giant-cell tumor Fortunately it is not necessary to determine beforehand which one of these two conditions we have because the surgical procedure in this case would be the same for both tumors

Operation.—Resection of the spine of the scapula with simple disarticulation at the acromioclavicular joint is the operation of choice in this instance. Generally speaking in giant cell tumor it is preferable to simply curet out the tumor and carbolize thoroughly the walls of the cavity but in this case where it would not be mechanically feasible from the standpoint of complete removal of the tumor and the control of hemorrhage resection must be employed.

In the course of the operation it turns out that the surrounding tissues are only moderately vascular the acromioclavicular joint is normal, the capsule or periosteum is unbroken and the bone at the base of the scapula directly in contact with tumor cells is smooth, compact, and quite avascular The removal of the tumor with its periosteum leaves in the wound therefore, no tissues that have been in direct contact with tumor-cells except the area of eburnated bone. After thorough carbolization of this area the wound is closed.

Pathology.—The gross specimen cuts without resistence throughout its whole length. The color of the cut surface is a homogeneous, grayish white the consistency is rubbery and not granular There is no necrosis or degeneration, but occasional

to the acromioclavicular joint. The periosteum everywhere is intact and there is a dense wall of bone between the tumor and the marrow cavity of the spine. Faint shadows of trabeculæ are to be made out, but no areas of bony proliferation are seen. Other special examinations, such as blood Wassermann, complete blood-count, von Pirquet, both human and bovine and *x-ray plates of the chest* are negative

Fig. 189.—Ray chondrosarcoma of scapular spine and acromion process. Clavicular joint uninvolved. Capsule is nowhere broken. Line of demarcation between tumor and uninvolved scapular spine is sharp.

Diagnosis.—This is a medullary tumor of the spine of the scapula. Medullary tumors of bone comprise bone-cyst or osteitis fibrosa, giant-cell tumor, chondroma, myxoma, fibrosarcoma, spindle- and round-celled sarcoma, and chondrosarcoma. This is benign tumor or a malignancy of recent development within a benign tumor. Primary malignancy in this tumor of six years' duration is ruled out by an absence of periosteal erosion, general symptoms, or chest involvement. Osteosarcoma is excluded by the lack of bone in the tumor. Chondrosarcoma cannot be eliminated, but the slow growth and small

## A BONE-CYST OF THE HUMERUS

This patient was brought to the hospital by a pathologic fracture which occurred five days before while throwing a base ball. His first intimation of trouble was a sudden pain accompanied by a dull snap in the region of his right shoulder. At the same instant his arm fell to his side and he has subsequently been unable to abduct it. Symptoms leading up to this event are totally lacking. He is unable to recall any aches, soreness or pains of any sort in this shoulder and he has never had a lame arm from throwing a baseball. From the general physical standpoint he is an exceptionally healthy boy and very large for his age. He is sixteen years old, weighs 155 pounds measures 5 feet, 10 inches in height, is well muscled and well proportioned, and has never been sick except for measles, mumps and pertussis in early childhood. He has played at baseball football tennis, and other violent sports, and for the past year or two because of his large size has done quite heavy work.

*x* Rays (Fig. 191) show the typical picture of bone-cyst. In the extreme upper end of the diaphysis of the right humerus is a sharply outlined, elongated, non trabeculated central cavity associated with slight expansion of the bone and marked thinning of the cortex. The outline against the medullary cavity is sharp. The periosteum and cortex are unbroken except along the line of fracture.

Discussion.—The proscribed treatment for bone-cyst is any procedure which results in a break in the cyst wall and subsequent reparative reaction. In pathologic fracture these ends are realized. The treatment, therefore, of bone-cyst in the upper end of the humerus complicated by pathologic fracture is simply proper alinement and support till the fracture is healed. These rules are not applicable, however, in this particular instance because the patient is just entering the age of central sarcoma and has passed the age when the clinical history and *x* ray pictures can be accepted as conclusive.

irregular somewhat darker areas suggesting hemorrhage are made out just beneath the capsule. The absence of red color and relatively soft consistency excludes giant-cell tumor The blue color of cartilage is also lacking, but with this exception the picture fits chondroma. The absence of cartilage in a chondroma would indicate the failure of the tumor-cells to reach full development and might mean malignancy

Fig 190—S 20, 2080 Chondrosarcoma Cartilage cells a slight amount of intercellular matrix

The study of the microscopic sections (Fig 190) show cartilage cells for the most part undifferentiated closely packed together and undergoing frequent mitoses. In some areas the cells have thrown out a slight amount of intercellular chondromucin, but have not developed true cartilage This tumor therefore is a chondrosarcoma.

cent. of the central tumors. From the standpoint of clinical findings the weight of evidence is decidedly in favor of bone-cyst or ostitis fibrosa and equally unfavorable for central sarcoma. The absence of pain is typical for bone-cyst, while the presence of pain in sarcoma is invariable and ofttimes precedes the demonstration of the tumor in the x ray. Pathologic fracture is common with bone-cyst and is frequently the initial symptom, while it probably does not occur in central sarcoma. Uniform expansion without periosteal erosion is typical of bone-cyst, but has not been observed in central sarcoma of this size. In spite of the apparently conclusive clinical evidence in favor of bone cyst an exploratory is immediately imperative because central sarcoma cannot be positively ruled out without a consideration of the pathology.

The treatment of central sarcoma is resection with a good margin of healthy tissue. The same rule applies to chondroma and myxoma. Amputation is never justifiable except where resection would mean a useless limb. This principle is based upon the fact that it is not local recurrence but rather pulmonary metastases which kills the patient after resection. Exploratory incision as a preliminary procedure in malignant cases does not detract from the patient's chances except in myxoma while in benign cases it sometimes means the preservation of a bone. Myxoma is so highly transplantable that it is never advisable to cut into one but this condition is so highly improbable in this instance that it need not be considered.

Operation.—The exploratory reveals a large blood-clot beneath the deltoid muscle, some fragments of bone and a cavity within the humerus filled with a bloody serum. There is no lining nor are there masses of tissue within the cavity except along the lines of fracture, where a fair amount of firm friable reddish-brown tissue bridges the gap in the bone. The inner bony surface is smooth and shiny and gives a distinct click to a metallic instrument. In other words this is a benign bone-cyst without lining or partitions.

Without further interference the wound is closed and the proper support for fracture of this part of the humerus is applied.

The central bone tumors are bone-cyst, ostitis fibrosa, giant cell tumor myxoma chondroma, and sarcoma. Giant-cell tumor may be dismissed as a possibility on account of the extreme rarity of this tumor before the age of twenty and because of the absence of pain and trabeculations. Central chon-

Fig. 191.—Benign bone-cyst of upper end of humerus. Line of demarcation between tumor and medullary cavity is sharp. The epiphyseal line is broken. The break in the periosteum on the side is the result of pathologic fracture.

droma and central myxoma are equally rare. Bloodgood's statistics show but one case of giant-cell tumor under twenty years of age while the combined cases of myxoma and chondroma at all ages constitute but 8 per cent. and there is but one case a myxoma, occurring before twenty. On the other hand between the ages of fifteen and twenty years sarcoma constitutes 50 per

## A CASE OF CLINICALLY DOUBTFUL BREAST TUMOR

THE first consideration in dealing with breast tumors is the recognition and proper treatment of cancer This has become a very simple matter with the development of the exploratory incision for cases that are clinically doubtful. Breast tumors fall into three clinical groups—benign, malignant, and doubtful The factors which determine this grouping are the age of the patient, nipple retraction, and skin changes. In this connection nipp e retraction is significant only when acquired and unilateral. while skin changes include all degrees of involvement of the skin overlying the tumor from the slightest shortening of trabeculæ to cancerous infiltration. A single tumor without associated skin or nipple changes in a woman under twenty five is benign with associated skin or nipple changes at any age it is malig nant. In women over twenty five all tumors without skin or nipple changes are clinically doubtful

This case exemplifies the clinically doubtful group in that the patient is forty-six years old the tumor is single and there are no skin or nipple changes. Since a further consideration of the clinical findings could lead us no closer to a positive diag nosis the tudy of the pathology at the exploratory incision is the next step It is interesting to speculate however as to the possibilities in this case and in the history we find the following facts The only symptom is tumor It appeared ten years ago and has maintained its original size in spite of four pregnancies and two children, with a five months period of lactation with each child. The mass lies in the upper portion of the lower inner quadrant it is sharply limited slightly bosselated, and fluctuant it measures 2 x 1 cm. it moves about freely under the skin over the muscle The surrounding breast gland is normal or possibly atrophic. Other findings, such as enlarged axillary glands, mediastinal involvement, anemia, or loss of weight, are negative The above facts point to a benign cyst, but the proof

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is lacking that there is no cancer alongside the cyst, and since the only concern is the patient's safety we must explore.

Exploratory.—The incision is made in a radius of the circle of which the nipple is the center. It is not advisable to make the incision in the circumference of such a circle because that would entail the division of the radial lymphatics, a highly undesirable state of affairs in case of cancer. Furthermore, should it be necessary to carry the incision into the breast gland proper many ducts would be cut across, causing permanent blocking distal to the point of division. As the skin is incised there pops into the wound a "blue-dome," which is recognized at once as a cyst containing serous fluid. A similar cyst in our series contained a straw-colored fluid, but also a few shreds of papillomatous structure, and just outside the wall on the under side a fully developed small scirrhous carcinoma was found. The incision must be continued therefore, through the cyst and deep into the underlying breast gland. In this instance the fluid is serous, the walls smooth and shiny, and there are no papillomatous growths, but in the breast gland against the cyst on the nipple side is a solid mass about 1½ cm. in diameter. This tumor is quite definitely limited but is not encapsulated. The surrounding breast tissues do not retract, but remain closely attached at the edge. The consistency is that of moderately firm rubber. The cut surface is grayish pink, slightly furrowed, and is dotted with a few yellowish-gray points.

What is the nature of this tumor? It is not a fibro-adenoma or periductile tumor because it is not encapsulated. It could hardly be chronic cystic mastitis with such sharp limitations, small size and absence of cysts. Cancer cannot be ruled out in the presence of yellowish-gray points suggesting necrotic plugs and the absence of a capsule. On the contrary, the pinkish tint, the lack of definite radiating connective-tissue markings, and the high degree of elasticity are decidedly against cancer because infiltrating carcinoma invariably is a dead grayish white, has definite connective-tissue markings, and had a boardlike cut surface. The only malignant tumor in our series which had a pinkish tint and elasticity was a cystadenoma

with a small carcinoma in its center The picture which this tumor presents is typically that of a localized, non-encapsulated cystadenoma, but our diagnosis is still in doubt so a frozen section must be made Accordingly a small piece is removed from the center of the mass the whole wound is carbolized till white, and packed with alcohol gauze.

Fig 192 —5 21, 1452 Benign localized cystadenoma of ten years duration. Tumor associated with single cyst containing straw-colored fluid, measured 1 cm. in greatest diameter was encapsulated. Breast gland atrophic

The question may arise as to the possibility of dissemination from the exploratory operation. This danger is reduced to a minimum when the exploratory is done with a few strokes of the knife and the phenol is applied within a few seconds of the incision In case the tumor is infiltrating cancer a single glance is sufficient to recognize the fact, and the interval between the incision and the carbolization need not exceed five seconds. The danger would be great in case the exploration entailed the

enucleation of the mass or removal of the breast gland, because such procedures are time consuming and mean the division of every lymphatic vessel leading from the tumor to the mediastinum and axilla. Bloodgood states that statistics in his series show no untoward effects in the explored cases.

The sections (Fig. 192) show the typical picture of benign cystadenoma without evidence of beginning malignancy or fully developed carcinoma. A complete operation is imperative

Fig. 193.—N. 720. Benign localized cystadenoma in breast showing chronic cystic mastitis. Tumor non-encapsulated, measuring 1 cm. across.

however for the following reasons. Positive proof that there is no cancer somewhere about this tumor is lacking; a complete operation means 100 per cent. chances of a cure while a partial operation in the presence of cancer would reduce the chances to 10 per cent. cancer frequently is found developing from or associated with benign cystadenoma. Bloodgood reports 18 cases of localized cystadenoma in his collection. Among these 1 showed cancer. 17 including the malignant case had the

complete operation, and all of them were cured. In our series of 4 3 were malignant and all had a complete dissection. Case I (Fig 193) showed a benign tumor associated with a moderate degree of chronic cystic mastitis. Case II was one of bilateral carcinoma. Cystadenoma was found on each side buried in the midst of the cancerous growth (Fig 194) and in the portions of the breast remote from the cancer (Fig 195) Case III was

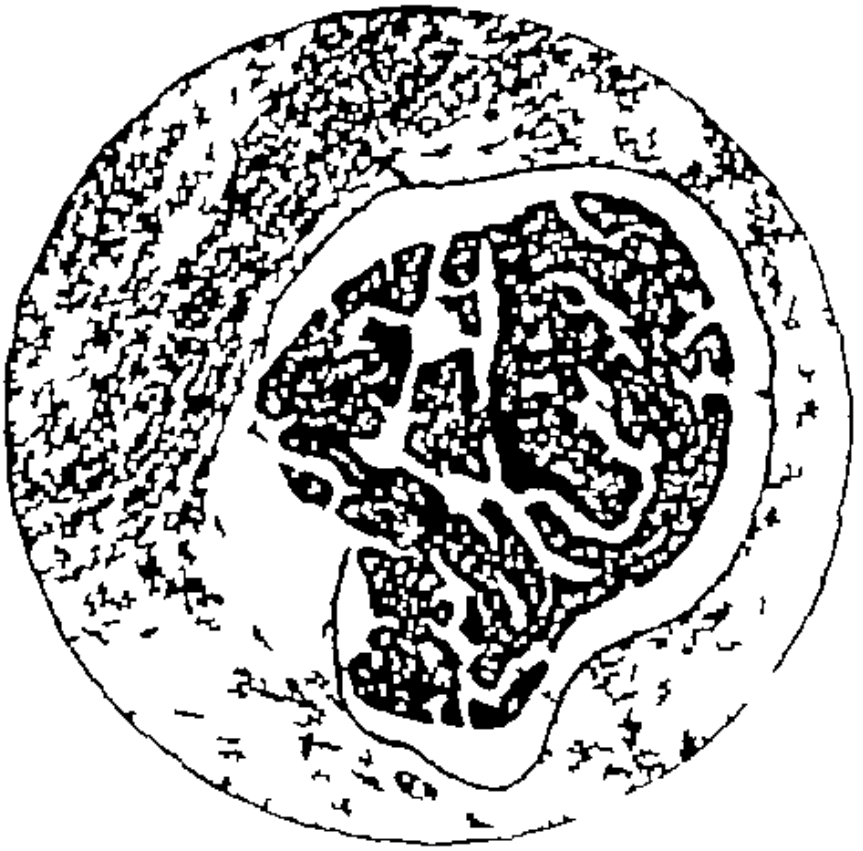

Fig 194.—S P 22, 31 Benign cystadenoma, papillary type, near the center of carcinomatous mass measuring 4 cm in diameter Duct lining is trophic

a combination breast hypertrophy lipoma, and cystadenoma. The tumor lay immediately beneath the lipoma and was discovered by accident after the fatty tumor had been completely divided. There was skin dimpling in this case which was explained by the lipoma. Grossly the condition was benign, but microscopically there were areas of adeno- and scirrhous carcinoma replacing a large portion of the cystadenoma (Fig 196)

Complete Operation.—The objective in a complete opera

tion is the removal of the tumor and the safeguarding of the patient against recurrence or the subsequent development of pathologic conditions in the breast. To attain this end it is necessary to remove every shred of breast tissue, and in one piece with this all subcutaneous and axillary lymphatic structures which have any relationship to the tumor and breast gland. The first consideration is the margin of healthy tissue to be removed with the tumor

Fig. 193.—S. P. 22, 31. Area of benign diffuse cystadenoma in breast removed from carcinoma. Same breast as Fig. 194. At extreme top is area showing large pale pink staining cells, typical of acinar type of senile parenchymatous hypertrophy.

The type of skin incision is of no importance except from the standpoint of closure of the wound and this in turn, has no bearing upon the cure of the disease. A margin of skin never less than 5 cm. and depending upon the nearness of the tumor to the skin or the amount of involvement, is marked off with the knife as the first step. Secondary incisions for the exposure of the axilla are then worked out.

The subcutaneous dissection is carried back mediahward as far as the opposite border of the sternum, superiorly to the clavicle inferiorly to the ninth rib and latterward well out over the surface of the latissimus dorsi muscle. All fatty tissues are thoroughly cleaned off from the skin-flaps overlying the breast for a distance of at least 5 cm. from the edges, because leaving fat might mean leaving breast tissue or subcutaneous lymphatics.

Fig 196—5 P 22, 16 Areas of cystadenoma in the midst of scirrhous carcinoma Rest of breast showed mild parenchymatous hypertrophy and overlying this tumor was lipoma Patient had x-ray treatment for two years on diagnosis of cyst Sense of fluctuation as given by lipoma.

The lymphatic vessels in the skin and subcutaneous tissue have been divided well beyond any possible areas of cancerous involvement the next move is the blocking of the lymphatic channels from the breast to the mediastinum and to the secondary axillary glands. The more important of this twofold procedure is the protection of the mediastinum because this region is inaccessible The first step therefore is the part of

the chest wall dissection which blocks the lymphatics to the mediastinum, that is the paring away of the sternal portion of the pectoralis major muscle from off the ribs and sternum.

A perfect axillary dissection means the removal with the tumor of every lymph-gland in the axilla. This necessitates the cleaning out of all loose areolar axillary tissue, and since the most important glands lie immediately against the vein wall, this vessel is laid bare of its outer sheath by sharp dissection. The muscular walls of the axilla are now clean, while the plexus and vessels stand out in detail as if they were polished. With the completion of the chest wall dissection and the removal or delivery of the mass, the curative part of the operation is accomplished.

The return to normalcy and the maintenance of function of the arm may now be considered. These are vouchsafed by the proper closure of the axilla, the prevention of infection, and early use of the arm. In the closure of the wound there is no tension, the axillary flap is tucked up snugly against the vessels, and this flap is long enough to allow the wound to be dressed with the arm in complete abduction. Infection which results in the swelling of the arm will be prevented by the most scrupulous asepsis of even the most minor defect in the skin until all is completely healed. Use of the arm will be insisted upon as early as the day following the operation. In the great majority of the cases a proper margin means insufficient skin for closure, and consequently means skin-graft. This will not be done at the primary operation because the grafts will prevent the proper packing of the axilla and the introduction of foreign skin will increase the chances of infection. The grafting will be done on the fifth day at the time of the first dressing.

Examination of the gross specimen shows an atrophic breast without other tumors or cysts. This case, therefore, is one of single localized non-encapsulated cystadenoma. The use of the term "cystadenoma" has led to a good deal of confusion because it has been erroneously employed to mean certain types of chronic cystic mastitis. There is this difference between the two terms, the one refers to new growth, while the other means a

dilatation or hypertrophy and hyperplasia of the duct or alveolar structures constituting the breast parenchyma. While cyst adenoma is a new growth, it may depart somewhat from the usual characteristics of tumors, in that it is sometimes diffuse and is non-encapsulated without infiltration. These two phenomena may have some bearing on the fact that malignancy does develop in these tumors, while as yet there are no proved cases of carcinoma in the midst of true encapsulated fibro-adenoma.

## CLINIC OF DR. P. K. GILMAN

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# SOME SURGICAL COMPLICATIONS OF AMEBIASIS

FORMERLY considered a disease of tropical countries amebiasis is now known to be fairly wide-spread in its distribution, and here in California is becoming of increasing importance. Since the war a more general interest has been aroused as a result of the great number of cases of dysentery occurring among the troops returned from Europe. When we know that too often a dysentery is considered the overshadowing symptom in cases of infection with this organism and that as many if not more harborers of the Amœba histolytica never suffer from looseness of the bowels, we begin to appreciate the place the disease occupies. While one and probably the most important, symptom of amebiasis is dysentery many cases suffering from amebæ never have this. Rather do they manifest a long list of gastro-intestinal disturbances often referable to the upper portion of the digestive apparatus. Many complain of actual constipation.

Amebiasis has for years been considered fairly common throughout the United States, more especially in the South, where generally endemic numerous epidemics have occurred. One symptom of the disease, dysentery has emphasized these outbreaks and no attempt of any importance has been made to determine the number of inhabitants complaining of the other equally important if less definite symptoms of amebiasis. If this were done at least an equal number of cases would come t light.

It is not infrequently stated in the literature that the amebæ of dysentery are found in the stools of healthy persons. While this may be possible it is usually not so. If a careful history is elicited it will be made out that the person infected will complain

of some more or less obscure symptoms referable to some portion of the digestive canal. Further if such cases be followed, it is not unusual, sooner or later for active and incapacitating symptoms to arise.

While many of our cases of amebiasis can blame a more or less extended residence in the tropics for their infection, as many more have necessarily contracted the disease within the confines of the United States. This is no doubt due in a measure to the ever greater interchange of population between our country and the Philliplnes, Japan, and the Hawaiian Islands, the increase here in California of house-workers from the former country being of especial importance.

While the treatment of amebiasis is in the large majority of cases medical, probably well over 90 per cent. yielding to at most, the third course of drug therapy a certain number will fail to be cleared of the organism or will fail to even improve. Of these, a certain percentage should become surgical. In addition certain complications of the disease require operative intervention.

The cases of amebiasis requiring surgical measures may be grouped under three main heads

1 Those cases in which operative intervention is demanded for the relief of pathologic processes set up within the bowel by the amebæ themselves

2. Those complications following diffusion of the organism and its implantation beyond the limits of the bowel.

3 In certain so-called "incurable cases with the object of removing at operation organs known lately to be the point from which reinfection of the gastro-intestinal canal occurs, after temporary clearing by medical means. This last group comprises cases where the amebæ have become implanted in structures accessory to the gastro-intestinal canal and in which sites the drug treatment employed has failed to wipe them out, probably because the drug has not reached the organisms in sufficient concentration.

Group 1 In the first group are cases exhibiting dysentery as their important symptom These may be either acute or

chronic and have failed to clear or show signs of improvement, or become worse, slowly or rapidly in spite of thorough treatment medically These require surgical assistance.

Likewise in those cases in which it is impossible even in the absence of active dysenteric symptoms, to establish proper conditions of nourishment, surgery should be considered. Further it should be considered early before the patient has become weakened as a result of improper food assimilation. Such cases will relapse when an attempt is made to increase their diet, the diseased bowel refusing to function properly

Our treatment, then, in this class of cases should aim at putting the diseased large bowel as completely as possible at rest. Formerly the desire was to do this in such a manner as would combine the best condition for its lavage. This question of colonic lavage is now believed to be of secondary importance since it has been shown by means of opaque enemeta that all parts of the large bowel are readily and promptly accessible by way of the anal opening The question of rest then becomes the important one

Three methods are available for use in this connection (*a*) appendicostomy (*b*) cecostomy and (*c*) ileostomy

Appendicostomy was introduced to facilitate lavage of the large bowel when this method of treatment held an important place in the therapeutics of dysentery At the period of this treatment it was not considered possible to reach all portions of the large bowel with fluids introduced per rectum and a through-and through washing out was introduced by means of the appendical tube However appendicostomy has lost much of its importance in this respect since the *x*-ray has demonstrated the great facility with which all portions of the colon and cecum may be reached by fluid introduced from below As readily shown under the screen it requires but a few moments for an opaque enema to travel from rectum to cecum and to be brought into contact with all parts of the lining mucosa. The appendix as well may be filled in many cases. Appendicostomy however in spite of this fact is of itself an extremely useful measure in certain cases. Beneficial results undoubtedly follow

the operation. In addition to the destruction of a focus for reinfection of the large bowel, improvement at times follows promptly on appendicostomy with through-and through lavage where the rectal route only had been previously used.

Of greater importance in many cases of amebic colitis is the question of absolute rest of the diseased bowel, and which method of bowel interruption best accomplishes this. Here must be considered those cases of severe type with persistence or increase of dysentery in spite of rest, rigorous medical treatment, and diet. The large bowel is so thoroughly diseased and irritable the slightest amount of material from above serves to keep up the diarrhea and weaken the patient. Without recourse to surgery rest of the large bowel is not possible.

As mentioned above two procedures are available—cecostomy and ileostomy and in choosing between these several factors must be taken into consideration.

Of the two operations, cecostomy is the more simple, in that it is more readily performed and the resulting opening more readily closed when it has accomplished its purpose. Moreover it allows of more direct access to the large bowel if lavage be considered advisable It does not, however result in a condition of complete rest of the gut below as not all the bowel contents will be evacuated through the opening Some fecal material will continue to be discharged along the colon

Ileostomy on the other hand is followed by absolute rest of the large bowel, and it is at times remarkable with what rapidity this rest is followed by cessation of symptoms. In patients who have been passing small quantities of blood, pus and mucus every few minutes, each passage accompanied by severe tenesmus, the relief is at times immediat

The operation, however as compared with cecostomy is less readily accomplished and, in addition, will necessarily be followed later by an intestinal anastomosis t restore the continuity of the intestinal canal. Further lavage of the large bowel is not facilitated by ileostomy but this factor is not as important as was formerly believed. In spite of the greater facility of cecostomy therefore, this advantage over ileostomy

is nullified by the more complete rest following the latter especially when combined with the fact that lavage of the entire large bowel is feasible from below

Group 2 Those complications following a diffusion of the organism beyond the limits of the bowel Under this heading occur cases of abscess.

These may be confined to the substance of the liver or extend through the diaphragm and result in empyemata or pulmonary abscesses, or having taken an opposite course produce abscesses within the abdomen.

Under the influences of the amebæ the liver may become the seat of pathologic changes varying from a simple hepatitis to almost complete destruction by single or multiple abscesses. During the stage of hepatitis and in some cases where the abscess is in its earlier stages medical treatment will still avail Where the abscess has attained any considerable size from necrosis of liver substance the treatment necessarily becomes surgical and free drainage must be instituted This involvement of the liver may be surprisingly acute at times seemingly a matter of days. In others the course is extremely chronic and may follow the intestinal infection only after an interval of months or even years. In 2 cases of our series of liver abscess the extensive collections of pus apparently developed simultaneously with the acute bowel symptoms. In another more than fifty years had elapsed the patient having remained free from any symptoms until he developed a large abscess of the right lobe of the liver Active amebæ were recovered from the walls of this abscess although none was found in the stools in spite of repeated examinations.

Amebic involvement of the pleural cavity is secondary to penetration of the diaphragm from a focus in the contiguous portion of the liver The process may arrest here without gross involvement of the neighboring lung, or may extend and form a second abscess within it. Naturally this complication is met with most frequently in cases of abscess situated in the upper portion of the right lobe of the liver although at times hepatic abscess of the more central and lower portion will

point upward and even posteriorly and involve the neighboring diaphragm, burrowing through and spreading upward in the chest. Care in diagnosis must be exercised in suspected cases of this condition as in a majority of abscesses of the liver situated toward the dome the lung on the opposite side of the diaphragm yields physical signs.

Lung invasion may remain localized and become more or less firmly encapsulated, but not infrequently rupture of the abscess occurs into a bronchus with the appearance of amebæ in the expectorated material. At time this sequence of events may lead to a cure provided the opening is large enough to establish sufficient drainage. This result was attained in 2 cases of our series.

In the majority of cases, however insufficient drainage is thus established along a tortuous route and additional free drainage must be supplied below generally at the most dependent portion of the cavity This is accomplished by opening into either the abscess cavity in the liver the subdiaphragmatic collection, or both. At times we have found it necessary to obtain drainage above the diaphragm as well, opening the lung abscess direct.

Opinions as to the best approach in cases of liver abscess differ some writers of experience advising the transpleural route. We have come to prefer drainage from below after exploring thoroughly the liver and its environs through a laparotomy incision. The transpleural route affords too restricted a field and does not allow a view of the distant portions of the liver gall-bladder and other viscera in relation with the under surface. The great advantage to the patient is the abdomen may be thoroughly explored before attacking the abscess.

If liver involvement be suspected and medical treatment appears to have remedied the condition, care must be exercised lest the patient be declared cured too early Too often the symptoms of a hepatitis or even beginning abscess disappear with the rest in bed and drugs, only to reappear with increased severity after the patient has assumed his normal activities, with the liver lesion far from perfectly healed

Abscess within the abdomen, accompanied by more or less surrounding peritonitis, is secondary not only to abscess originating in the liver and pointing downward but also follows perforation of the bowel the result of ulceration When one sees a badly diseased colon from a case of active amebiasis one wonders not that cases of perforation and peritonitis occur but that they are not encountered more frequently Leakage at the point of perforation takes place and, where few or no adhesions have been permitted the escape of infectious material occurs directly into the peritoneal cavity Depending upon how effective the patient's resistance is as evidenced by protective walling off the peritonitis may be local or general. In such cases we are dealing with added bacterial infection where the pus from abscesses confined to the liver or resulting from this location is at least at first, bacteriologically sterile.

Perinephritic abscess is a complication of amebiasis more frequent in some reported series of cases than in others. In our personal series we have never encountered this condition. There are two pathways possible for infection—from the colon direct and secondarily to abscess of the liver pointing toward the kidney region.

Before leaving the subject of intra-abdominal inflammation mention must be made of amebic granuloma. This condition is an inflammatory mass developing in association with the wall of the large bowel and involving a portion or the entire circumference of the gut. One or another of the flexures of the colon are often the site of such a mass which may attain a considerable size, be readily palpable through the overlying abdominal wall and suggest strongly true new growth of the bowel. In one such case we saw resection of the colon for malignant disease done a previous examination of the stools for amebæ having been neglected.

These granulomata will usually disappear if the proper medical treatment for amebiasis be instituted. Only rarely will surgical measures become necessary to relieve obstruction.

As a possible sequel of any of the above group of lesions must be mentioned adhesions. These are often serious, and if

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from some focus within the body It has been possible at best to clear the stools of such persons only temporarily and when the course of drug treatment has been completed the amebæ reappear in the stools sooner or later for at least a time without symptoms. It is in these cases that the amebæ have become firmly implanted in structures accessory to the gastro-intestinal tube, where apparently the drugs employed cannot be brought into contact with them in sufficient concentration to destroy them.

That the appendix may be such a focus from which reinfection occurs is undoubted and has been recognized for some time. Cases the stools of which have been temporarily cleared repeatedly have become permanently cured following the removal of their appendices in which amebæ have been demonstrated both in scrapings from the mucosa and in microscopic sections. In one of the more striking cases of our series too ill for a general anesthetic repeated clearing of the stools was followed by a severe recurrence of symptoms leading to rapid downhill progress. Removal of a large infiltrated appendix under local anesthesia was followed by prompt recovery the patient having remained well when last seen seven years later

Appendix pain is not uncommon in intestinal amebiasis, and while often due to changes in the cecum at times the appendix itself is the seat of amebic ulceration and accompanying inflammatory changes

The demonstration of amebæ in the wall of the gall-bladder several years ago by Crowell in Manila and confirmed on several occasions by Gunn in San Francisco more recently called our attention to this organ as a possible site from which reinfection might occur

Whether the gall-bladder harbors amebæ in all cases of intestinal amebiasis and the drugs used in medical treatment reach this organ in diminished concentration only in certain patients is not definite. It is certain that cases considered incurable by medical measures after repeated trials extending over long periods have cleared promptly following cholecystectomy amebæ having been later demonstrated in the mucosa of the

they fail to cause acute obstruction will produce a long list of complaints accompanied by more or less incapacitating symptoms.

Cases of amebic abscess of the brain and spleen have been reported. It is not remarkable that these should occur when it is entirely possible that cases of generalized amebiasis are met with

3 In the final group we have placed those cases of chronic or recurring intestinal amebiasis in which well-directed medical treatment has failed. This formerly comprised a considerable percentage of persons infected, but with later methods of drug exhibition the group has been greatly reduced. In addition, we have included under this third class the so-called "latent cases or carriers." We use this latter term of carrier advisedly for in spite of the fact these individuals show few if any symptoms none of them incapacitating symptoms nevertheless exist and will be brought to light if sufficient care in searching be practised.

The question of first importance here in both types of cases—the chronic or recurring and the carrier—is naturally When should we consider medical treatment has failed?

My colleague, Dr Herbert Gunn, whose extensive experience with amebiasis and its treatment allows him to speak authoritatively makes it a rule to consider the case incurable medically if there is a reappearance of the amebæ in the stool during a course of combined emetin and salvarsan treatment after the salvarsan has been administered as well as cases that do not respond to the drug treatment promptly

In regard t carriers Gunn holds the case to be incurable medically if amebæ reappear in the stool after three thorough courses of the bove-mentioned combined treatment as advocated by him such a course of treatment extending over period of three full weeks, the patient being in a hospital nd confined practically t bed.

This last group then comprises those cases in which the organism may be gotten rid of in the immediat gastro-intestinal tract only for a shorter or longer period followed by reinfection

from some focus within the body It has been possible at best to clear the stools of such persons only temporarily and when the course of drug treatment has been completed the amebæ reappear in the stools sooner or later for at least a time without symptoms. It is in these cases that the amebæ have become firmly implanted in structures accessory to the gastro-intestinal tube where apparently the drugs employed cannot be brought into contact with them in sufficient concentration to destroy them.

That the appendix may be such a focus from which reinfection occurs is undoubted and has been recognized for some time. Cases the stools of which have been temporarily cleared repeatedly have become permanently cured following the removal of their appendices in which amebæ have been demonstrated both in scrapings from the mucosa and in microscopic sections. In one of the more striking cases of our series too ill for a general anesthetic repeated clearing of the stools was followed by a severe recurrence of symptoms leading to rapid downhill progress. Removal of a large infiltrated appendix under local anesthesia was followed by prompt recovery the patient having remained well when last seen seven years later

Appendix pain is not uncommon in intestinal amebiasis and while often due to changes in the cecum at times the appendix itself is the seat of amebic ulceration and accompanying inflammatory changes.

The demonstration of amebæ in the wall of the gall bladder several years ago by Crowell in Manila and confirmed on several occasions by Gunn in San Francisco more recently called our attention to this organ as a possible site from which reinfection might occur

Whether the gall-bladder harbors amebæ in all cases of intestinal amebiasis and the drugs used in medical treatment reach this organ in diminished concentration only in certain patients is not definite It is certain that cases considered incurable by medical measures after repeated trials extending over long periods have cleared promptly following cholecystectomy amebæ having been later demonstrated in the mucosa of the

removed gall-bladders. In these cases the appendix had been previously removed.

To summarize. The drug treatment for amebiasis if properly carried out will cure a large percentage of the cases with one course. A smaller number will require a second, and a still smaller number a third, course of drugs. Of the remaining small number a certain percentage suffer reinfection from a focus situated either in the appendix, gall-bladder or both. Removal of these foci will be followed by permanent cure.

In such a report as this one must not conclude without emphasizing the fact that in this country infection with the Amœba hystolytica is much more wide-spread and of greater importance than is generally believed. The importance is such that this organism must be considered in a differential diagnosis of a great many diseases of the gastro-intestinal tract. No at all obscure abdominal condition should be treated surgically until a careful search of the stools has been made for amebæ and by a competent, trained person.

The importance of this is appreciated when one recalls that infection with the Amœba hystolytica does not necessarily mean dysentery with blood and pus in the stools. Often the condition is a chronic one from the beginning and the symptoms may never call attention to the colon, but refer to the upper gastro-intestinal region, with gas. cidity loss of appetite nausea, and allied symptoms combined with loss of weight and strength.

## CLINIC OF DR. HAROLD BRUNN

Department of Surgery University of California,
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# THE SURGICAL TREATMENT OF CANCER AT THE RECTOSIGMOID JUNCTURE

The subject of bowel anastomoses has always been a fertile field for experimental and clinical discussion. It has had its fascination for surgeons the world over evidenced by the fact that at least three hundred methods have been described in the literature. But, as Halstead very recently stated, "The last word on the subject of intestinal suture may some day be written but surely not until much experimental work has been done with an exactness not hitherto contemplated in investigations of this nature." The variety of methods used at different clinics for anastomosing the bowel at the rectosigmoid juncture, where the difficulties are considerably greater than elsewhere and the interest again shown in the literature on the subject, confirm the fact that we are still far from an accepted type of operation, which, both by experimentation and by practice has proved its worth. Nor have we proved beyond question either the principles on which intestinal anastomoses should rest or the technical details by which it should be carried out.

Some years ago we had an unfortunate fatality from infection. The case was that of an extremely corpulent woman in whom we attempted an end-to-end anastomosis by the tube method of Balfour" for cancer at the rectosigmoid juncture. This experience led us to search for another method by means of which the bowel ends could be brought together with less exposure of the lumen in the operative field thereby diminishing the possibility of infection. In other words we wished to make this operation as safe from infection as is a gastro-enterostomy. The method finally chosen was that developed by Parker and

Kerr and described by them in the *Johns Hopkins Hospital Bulletin* for May 1908 an experimental study entitled "Intestinal Anastomosis Without Open Incision by Means of Basting Stitches." For several years we adopted this method for small bowel anastomoses as carried out in their experiments The method was successful in its ease of accomplishment as well as in its final results.

We did not find an opportunity to use it for cancer at the rectosigmoid juncture until 1917 At this time we were asked to see a patient in consultation with Drs. Moffitt and Schmoll at the Children's Hospital. She was a strong, healthy woman, aged forty-one. A severe rectal hemorrhage was her first symptom. This came on suddenly on August 23 1916, *six months previously* *It is of interest to note that there were no* premonitory symptoms of any kind to draw attention to the bowel condition, neither constipation pain, colic, nor abdominal soreness. From time to time following this however many symptoms developed suggestive of carcinoma of the bowel, but undiagnosed until the patient consulted Dr Moffit. A proctoscopic examination on February 1 1917 discovered carcinoma near the rectosigmoid juncture. Operation was performed on February 6, 1917 according to the method about to be described, without preliminary colostomy We were surprised at its ease of performance and at the smoothness of the patient's recovery Neither infection nor hemorrhage followed the operation The bowels moved readily following a light cathartic on the seventh day Since that time the patient has had no evidence of obstruction or stricture A proctoscopic examination has been made on three occasions, and discovers the site of anastomosis with difficulty The patient is alive and well, with no evidence of recurrence at the present time some five years after

Before describing the operation in detail a word should be said about preliminary colostomy as an adjunct to the main operation. We have come to look upon the preliminary colostomy as almost essential It is seldom a mistake and its omission ofttimes a source of regret Its advantages are manifold even in cases which do not present symptoms of obstruc

tion, either acute or chronic. Following its performance the patient's general condition is markedly improved. This is brought about in many ways. If hemorrhage is the dominant symptom, it is lessened. If pain, tenesmus, and frequent stools are exhausting the patient, they cease and a comfortable rest is given. The inflammatory reaction and the consequent absorption at the site of the cancer are modified. The movement of the fecal stream over the ulcerating surface with active peristalsis is done away with The operation, while imperative in any acute or subacute obstruction, is a valuable aid even in chronic types, as it is often impossible to cleanse the bowel properly without it. Finally the presence of a colostomy permits healing of the anastomosis with the bowel at rest and with no strain upon the intestinal suture. Moreover the patient is relieved of the dangers of serious gas distention which commonly marks the convalescence of these cases. We feel that such a colostomy should completely divert the fecal stream from the field both before and after operation We have, therefore given up the use of a cecostomy where a spur is difficult to make except in a few cases where the mesentery is very long Our choice is the transverse colon drawn through a right rectus incision at about the level of the umbilicus. This mobile bowel allows the making of a good spur as well as complete diversion of the fecal stream and has the added advantage of being away from the future operative site.

In those cases where conditions permit the performing of the operation in one stage, a cecostomy recommended by Stiles in the British Journal of Surgery July 1921 has some advantages. In this operation a small portion of the cecum is stitched to the peritoneum and muscle (not to the skin) A small catheter is placed in the cecum, extending through the ileocecal valve into the ileum. This tube acts as a safety valve for gas and liquid fecal matter increases the comfort of the patient, and relieves any strain on the suture line It can be quickly done, and the opening usually closes by itself.

The anastomotic method for cancer at the rectosigmoid is as follows

Patient placed in the Trendelenburg position, gradually assumed.

*A long left rectus incision from the pubis to the umbilicus.* Careful examination of the tumor and involvement of other organs or the peritoneum, the palpation of lymph-glands draining the cancerous area, and examination of the liver for metastases

Conditions being favorable for operation, the first step is the mobilization of the rectum and sigmoid by incision through the outer leaf of the mesentery This incision is shown in Fig 197 Its lower end extends across the base of the bladder in the male *and to the level of the uterosacral ligaments in the female.* This transverse portion of the incision allows the rectum to be elevated by adding considerable length to the rectal segment, thereby permitting section of the rectum 2 or more inches below the carcinoma. The mesentery is now tied off to include all the bowel and such glands as are to be removed. The rectum and sigmoid are lifted free from their attachments and the operative field is surrounded by pads

Right-angled Wertheim clamps are applied to the rectal segment 2 inches or more below the growth and similarly on the sigmoid about 6 inches above the growth (Fig 197) It is important to see that the two leaves of the mesentery of the sigmoid are brought together as nearly as possible around the bowel, and also that the outer leaf of the rectum should peritonize as much of the raw surface of the rectum as possible. The clamps should include these edges in their grasp as shown in Figs. 198 199 This aids very much in bringing the peritoneal surface in contact at the time of anastomosis, and prevents leakage. Secondary clamps re now applied close to the first They should crush the bowel to thin ribbon and then be reapplied a short distance above (This is not properly shown in Fig 197 The bowel bould not bulge between the clamps) The actual cautery easily severs this thin ribbon of bowel between the clamps and the edges are well sterilized with heat

*The Parker and Kerr basting stitch* is now applied, preferably with a Pagenstecher linen thread (Fig 199) Not should

be made of the first and last stitches, which are longitudinal to the bowel, and of the other stitches, which are transverse to the

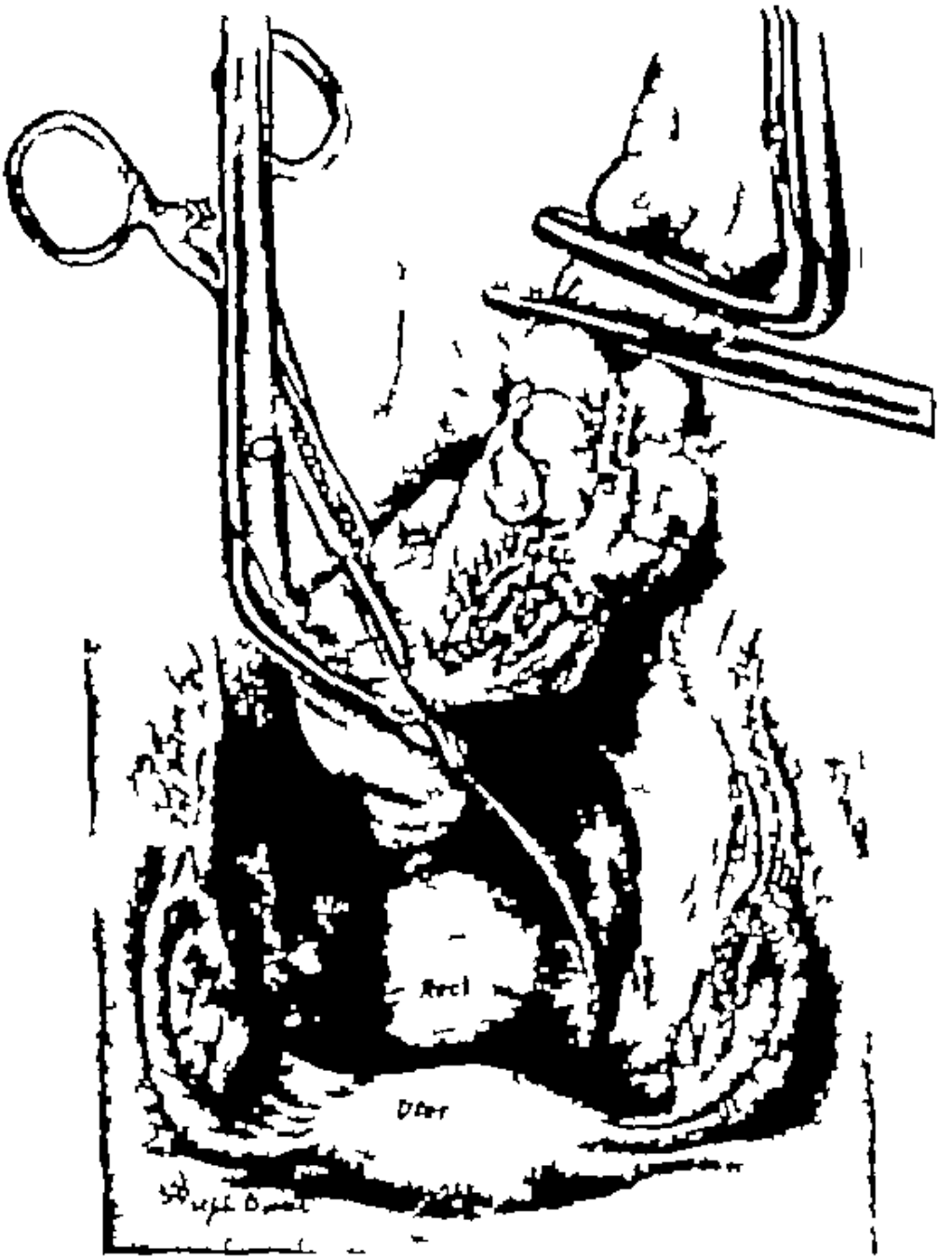

Fig. 197.—Method of mobilizing rectum. A longitudinal incision is made along the outer leaf of peritoneum and extending transversely across the cul-de-sac of Douglas at the level of the uterosacral ligaments. Right-angled clamps have been placed above and below the tumor.

bowel and as close to the clamps as possible. This prevents an in-turn with a wide diaphragm. It might be stated in pass-

ing that the danger of obstruction from a wide diaphragm at the site of anastomosis is very slight. The experiments of Halstead seem to prove that this diaphragm speedily contracts and atrophies, and that very soon afterward no trace of it can

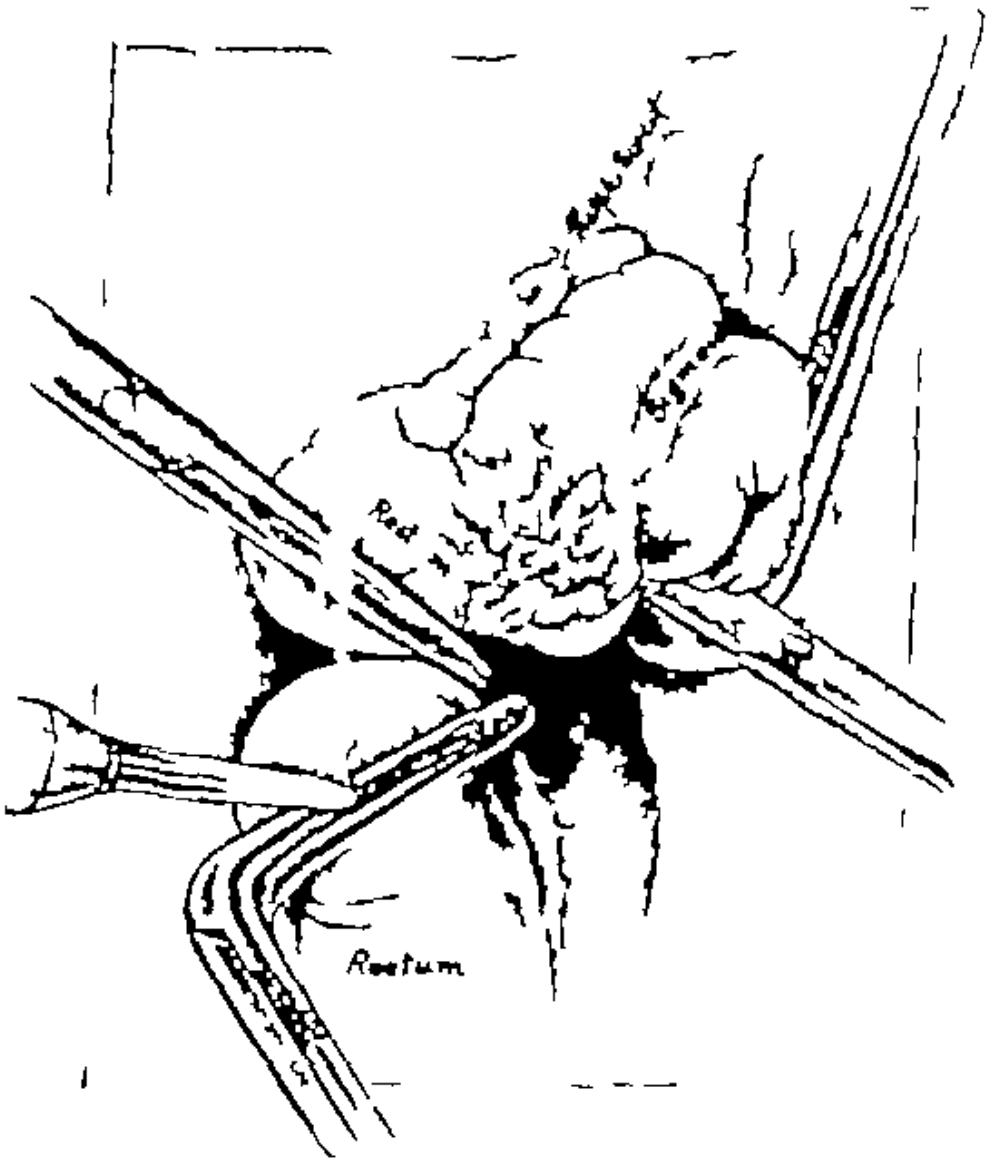


Fig 198.—The mesentery has been tied off. The bowel is being burned by the actual cautery.

be found. In his experimental work little remained of the diaphragm on the tenth to the seventeenth day. This is verified in the specimen shown in Fig. 202 which was removed some two and a *half months after the anastomosis. It was difficult*

to tell where the line of suture was. The picture shows the anastomotic line just above the perforation in the bowel. The mucosa was perfectly smooth and there was as can be seen, a slight in-turn at the mesenteric border which was the only indication of the anastomotic site.

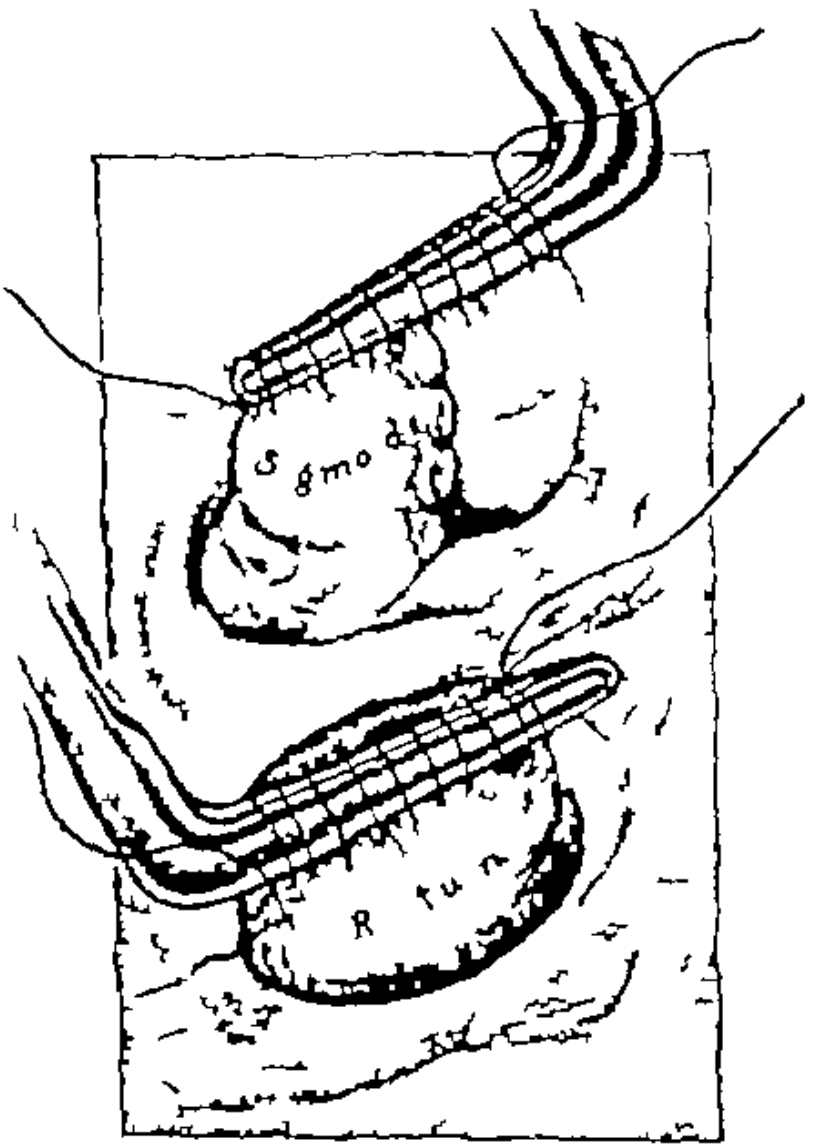


Fig. 199.—Insertion of the Parker Kerr basting stitch on sigmoid and rectal ends. Not beginning and end sutures and the bringing together of mesentery at the sigmoid end.

The clamps are now carefully removed in the usual manner and the two ends of the basting stitch drawn taut. The ends of the bowel are turned in without soiling the field, and small artery forceps grasp the basting stitch on either side of the

bowel as shown in Fig 200 If the sigmoid end is much larger than the rectal end as often happens following long chronic obstruction it is only necessary to pucker the bowel more on the

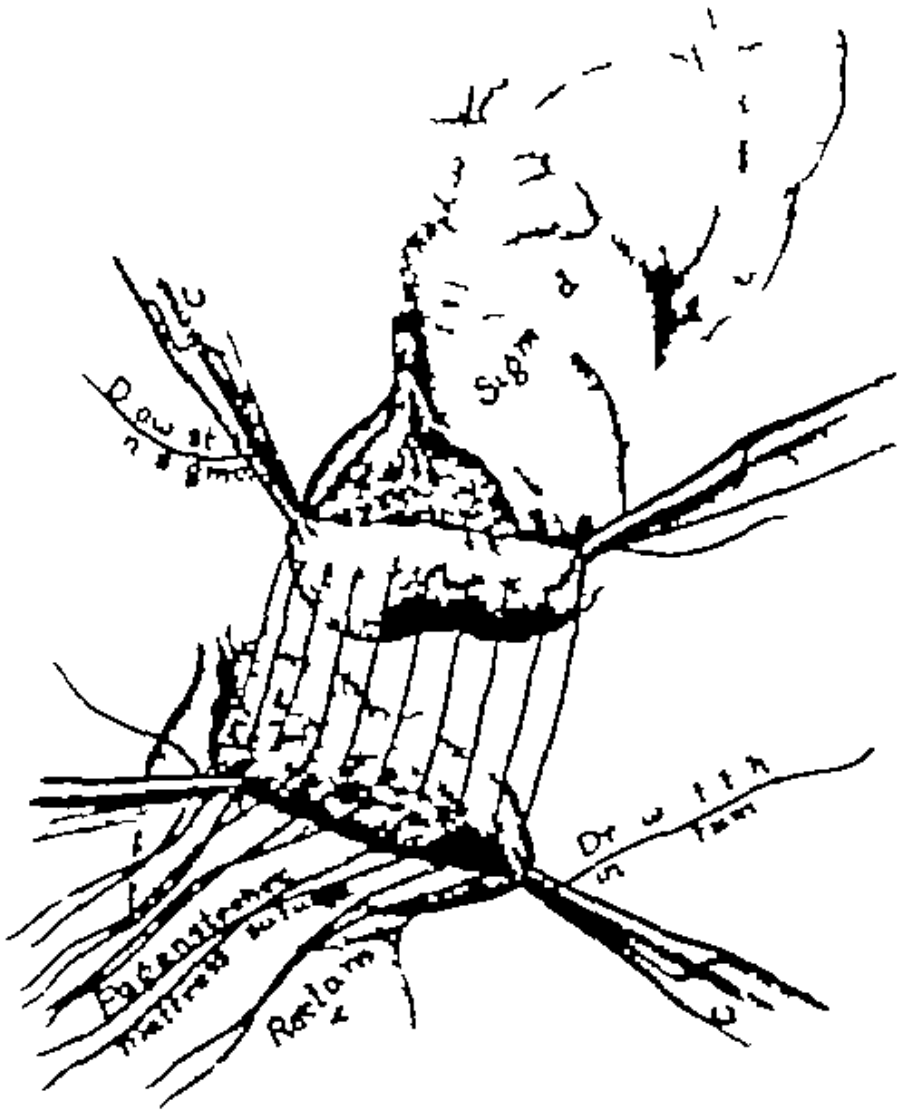

Fig 200—The basting stitch has been drawn taut ertain the bowel The ends are clamped ith forceps close to the bowel The sigmoid end has been partially rotated to prevent he m mesenteric area from coming in contact ith nmular area on the rectal end The first layer of mattress eatures is placed on he posterior surfaces

sigmoid side with the basting thread No other method accom plishes this purpose so readily

The two ends of the bow l re now brought together for

anastomosis care being taken that the ends meet without tension to avoid longitudinal strain. The sigmoid end is given a slight twist, as advised by Balfour in his 'tube anastomosis so that the two mesenteric surfaces uncovered by peritoneum do

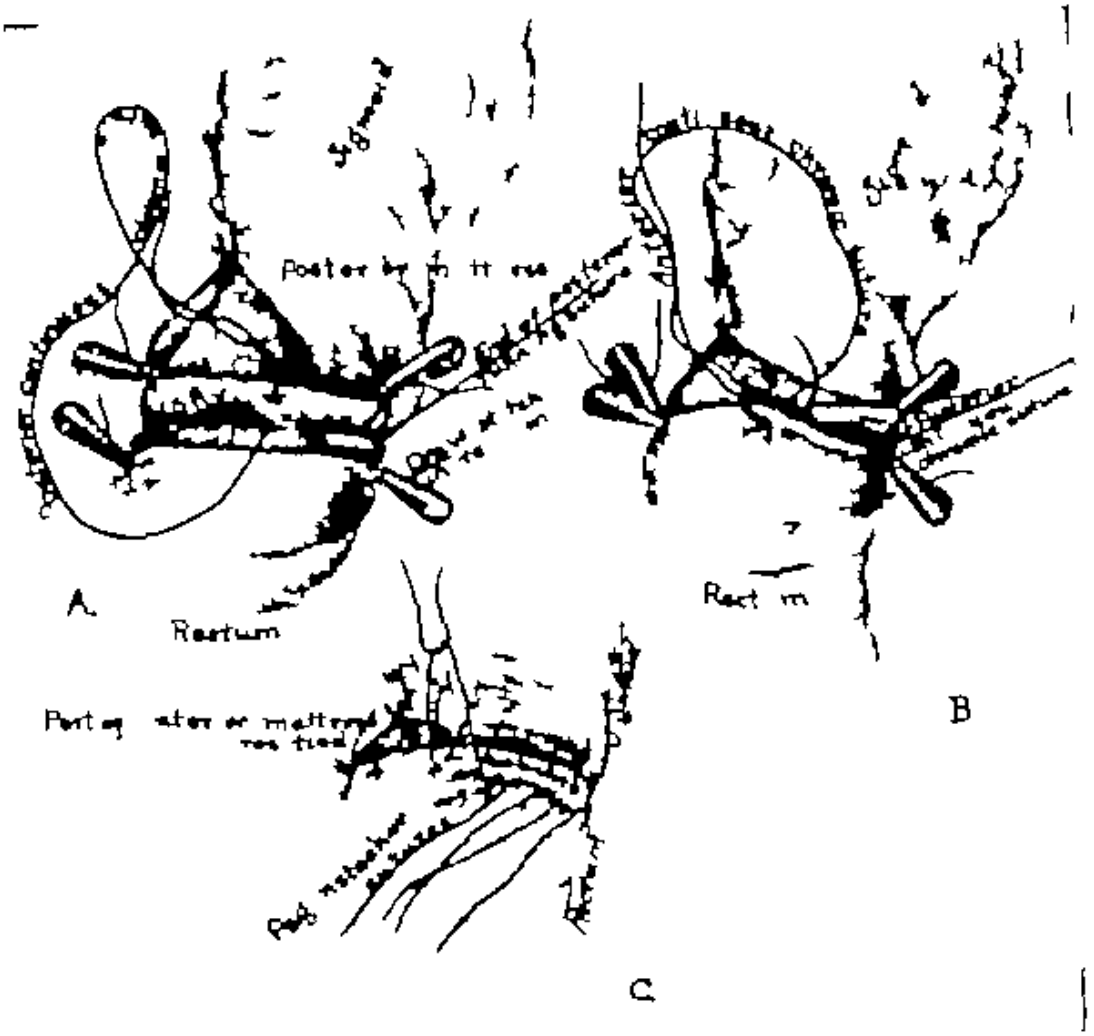


Fig 201.—*A* The posterior mattress suture tied The continuous circular stitch begun on the posterior surface *B* Circular suture closing anastomosis in front *C*, Anterior mattress sutures applied and being tied. The basting stitch has been removed

not come in contact (Fig 200) Three or four mattress sutures of Pagenstecher now unite the two ends of the bowel posterior to the draw stitch and a little distance from the closed ends (Fig 200) These are tied (Fig 201 *A*) The continuous suture which is to encircle the anastomosis is now placed. This

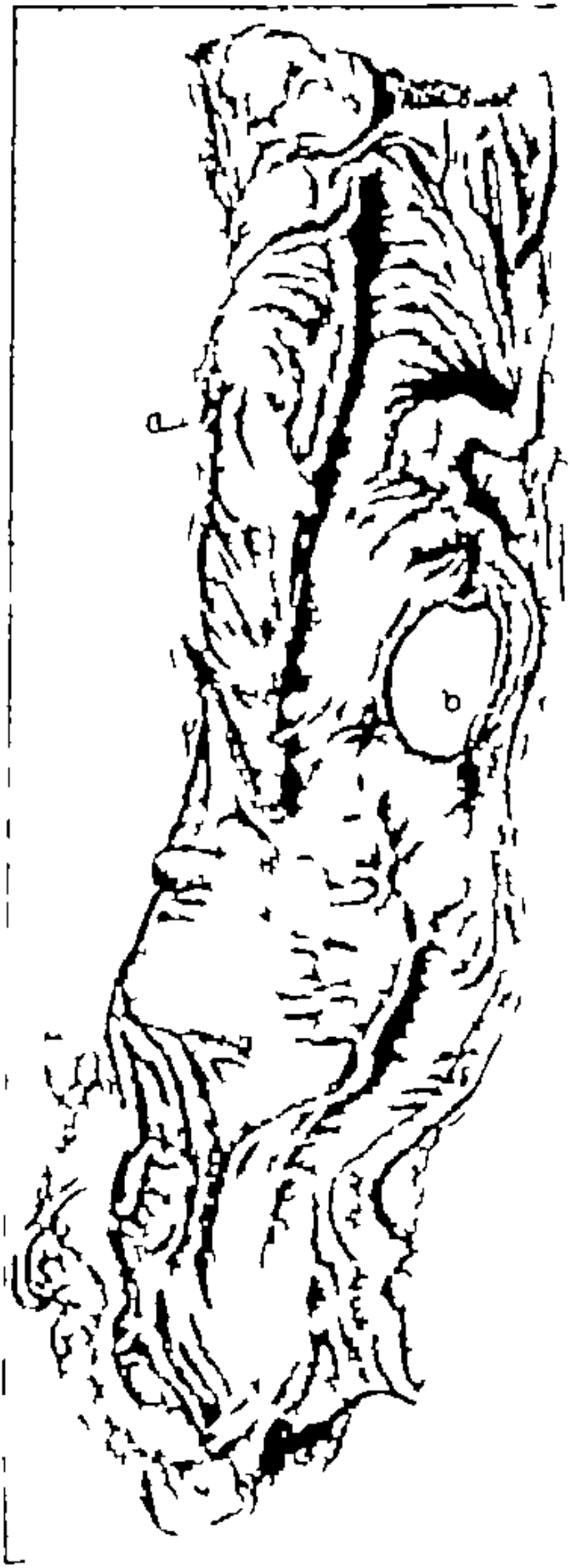


Fig 202

stitch is of No 1 or 2 chromic catgut, begins on one side of the posterior surface, and passes around in front, the two ends being tied at the completion of the suture (Fig 201 *A B*) Three or four mattress stitches of Pagenstecher are now placed on the anterior surface (Fig 201 *C*)

The anastomosis has now been completed without exposure of the bowel ends or fecal contamination. It is only necessary as a final stage to cut one side of either basting stitch which closes the bowel, and withdraw the other end. This opens up the anastomosis, and is facilitated by a gentle massage of the anastomosis between the fingers. On several occasions we have attempted to insert a rectal tube through the anastomosis per rectum. We have never been successful in doing this and the amount of handling of the bowel necessitated thereby makes it inadvisable

It has been our custom in performing this anastomosis to apply two rows of stitches as described above an inner circular and an outer mattress stitch. The presence of a raw surface on the rectal and sometimes on the sigmoid side makes it impossible to have peritoneal contact throughout the anastomosis therefore a double row of sutures, at least in these uncovered areas seems advisable in order to avoid leakage.

Halstead however in performing his blind end anastomosis, makes use of a single row of mattress sutures only while Parker and Kerr in their experiments on the small bowel give preference to a single continuous stitch encircling the bowel. They draw attention to the fact that "the tension to which intestinal stitches are subjected under ordinary conditions comes almost wholly from internal pressure in the intestinal tube. In hydrostatics the law which applies to such a case is that, in a thin-walled tube subjected to internal pressure the circumferential strain upon the walls of the tube is double the longitudinal strain. As applied to circular suture of the intestines this means that the longitudinal strain which tends to pull the edges of the

Fig 202.—Bowel removed from Mrs. B *a*, Slit of anastomosis. No evidence of diaphragm formation except in the tissues out beyond the mucosa; *b*, opening shown in bowel. Sets of the perforation with bougie.

inclation apart equals only half of the circumferential strain which tends to tighten the stitch if a continuous suture has been used

Whether a single circular a single mattress, or both should be used is, *therefore still open for discussion.*

Since adopting this particular method we have carefully scanned the literature for any improvement either in principle or in technic, but up to the present time we have found nothing that is so simple and easy of accomplishment. Shoemaker of the Hague (Surgery Gynecology and Obstetrics December 1921) describes a closed method of anastomosis in which the mucosa is freed and grasped by hemostats the latter not being removed until the last stitch is applied. This method is more complicated and would be difficult to carry out in the pelvis. The method of Holman for small bowel anastomosis (Johns Hopkins Hospital Bulletin September 1920) fails to meet the absolute requirement of closed ends and is also complicated in technic. Methods have also been described by Horsley (Annals of Surgery 1919) Balfour "The Tube Method of Anastomosis, mentioned before, Crile, (Amer Med. Assoc. July 1920) and Stillman, of San Francisco (*Annals of Surgery February 1918*) The latter closes the upper sigmoid with a purse-string suture with the ends left long holds the rectal and open with guy sutures rims out about 2 inches of the rectal mucosa, then draws the closed sigmoid end into the rectal end by pulling the long purse-string suture out through the anal opening All of these methods do not a void possibl contamination by working with an open bowel. Halstead recently (In the Annals f Surgery March, 1922) describes "Blind End Circular Suture of the Intestine Closed Ends Abutted and the Double Diaphragm Punctured with a Knife Introduced per Rectum. This method is easier of accomplishment perhaps but requires the introduction of a knife blindly through the anastomosis and t does not seem probable that it will ever become popularized

We ha e now performed this operation on 10 cases without any difficulty and with an xtremely smooth convalescence There has been no shock the pulse seldom going bove 100

and with a temperature rise no greater than in any simple operation. There have never been obstructive symptoms. The bowels have moved easily except in one case which will be described later where a technical error was made

We have had two deaths. One occurred suddenly on the fifteenth day due we believe to a pulmonary embolism following the giving of an enema. There was no autopsy but, as far as we know there was no trouble with the anastomosis. The second death is of considerable interest and perhaps deserves more extended comment.

Mrs. B aged thirty nine Seen in consultation with Dr Casper June 1921 at the Mt. Zion Hospital. On examination a large mass was found in the left side of the pelvis which was very tender hard and irregular in shape immovable and fixed to the pelvic wall. Flouroscopic examination by bismuth enema showed an annular constriction 2 inches wide in the sigmoid, and this with her history of the passing of blood and mucus, extending over a year made a diagnosis of carcinoma probable. There was some elements in the case however the high white blood-count (21,200 polys. 91 per cent.) the exquisite tenderness of the mass and the acute symptoms which it had produced on occasion, especially at the time of menstruation, which could not exclude the possibility of a primary malignancy of the ovary or of an inflammatory mass.

Operation was performed on June 27 1921 A large mass was found in the left lower quadrant which could not be elevated and was composed of the sigmoid wrapped around and adherent to the left tube and ovary The mass appeared to be inflammatory and it was difficult to decide even then whether the trouble was primarily in the ovary or in the bowel Our impression was rather that an old abscessed chronic inflammatory tube and ovary had ruptured into the sigmoid.

We made a separation through the friable indurated tissue and finally split the bowel off from the tube and ovary expecting to enter a pus-pocket, but this was not the case During the separation the bowel was exposed down to the mucosa for an area of 2½ to 3 inches. The edges of the bowel sur

rounding this were indurated, and the mesentery for a considerable distance was thick and infiltrated, as were the epiploic appendages.

The tube and ovary were removed and it was decided to remove as well the involved sigmoid. An anastomosis was done in the manner already described. Because of the inflammatory reaction in the operative field and the difficulty of placing our stitches in sound tissue and because of the doubt in our minds as to whether or not this was a case of cancer we varied our usual technic and brought the anastomosed bowel up to the lower end of the abdominal incision with stay sutures, so that, should infection or leakage occur it would be easy of access. Microscopic examination of the specimen by Dr Bartlett, at the University Hospital, proved it to be carcinoma of the sigmoid.

Following operation the patient suffered practically no shock, voided urine, the temperature the following day reached 100.2° F., pulse 84 to 90 On the third and fourth days a small amount of fecal matter and gas were expelled through the rectal tube. On the fifth day cathartics and enema failed to give a result, and the patient began to be quite distended. The temperature and pulse remained practically normal. Distention and vomiting increased, however and on the sixth day not having obtained a bowel movement, we advised a cecostomy which was done by Dr Casper This relieved the patient completely and her bowels continued to move through the cecostomy opening The patient was now going along very well, and at the end of a month was in every way in normal condition. On proctoscopic examination we were never able to expose the anastomosis. There seemed to be a block, although from time to to time the patient would pass gas per rectum About a month following the operation against our wish an attempt was made t pass rectal bougie through the anastomotic opening, using the proctoscope to guide it. On one occasion this seemed to pass, but on repeating the maneuver the bougie evidently perforated the rectum below the anastomosis. The patient passed into shock and infection followed from which

she finally died on September 15th about two and a half months after the first operation. A partial postmortem was obtained. The specimen of bowel at the anastomosis is shown in Fig 201 The cause of the obstruction, as can be seen was not the anastomosis but was a kinking brought about by the attachment of the bowel to the lower end of the abdominal wall. The specimen also shows the opening in the bowel which was produced by the bougie. At first it was difficult to locate the exact site of the anastomosis and, indeed, impossible to be sure until microscopic section had been done. The bowel was smooth, the lumen was large enough for all purposes. The only contraction occurred in the tissue on the outer side. Unfortunately it never occurred to us that the obstruction was due to a kink rather than to some fault in the anastomotic opening

The 8 remaining cases made a perfect recovery A proctoscopic examination has been made in 4 of them. The anastomoses could hardly be detected. In one however there is a slight narrowing, just admitting the proctoscope but it gives no trouble whatever The first case as reported above done in 1917 has now passed a few months over the five year period.

In conclusion, attention should again be drawn to the fact that cancer at the rectosigmoid juncture for which an anastomosis must be done presents peculiar problems of its own, and other methods used where the bowel can be brought upon the abdomen are here technically difficult because of insufficient room. The dangers of infection are also greatly enhanced. The poorly nourished fatty tissues of the postrectal space become most readily infected The space is difficult of drainage, and as Crile states in his own series 'Infection rather than hemorrhage o shock is the chief cause of death. The swarming germ life of the large bowel is increased in virulence in cancer of the bowel, either because of obstruction or because of the ulcerating cancerous mass, so that methods adapted to anastomoses in other regions cannot be substituted here with the same assurance of success. With open bowel ends the transplantation of cancer cells is made possible. Furthermore, the closed end method allows of a more liberal section of the rectum distal to

the carcinoma than any other method. In fact, cases that would ordinarily have to be operated upon by the sacral route can be safely carried to completion intra abdominally

It would seem to us that this method deserves a wider use than it has heretofore received

## CLINIC OF DR. WALLACE L. TERRY

### University of California Hospital

# INTRATHORACIC GOITER

True intrathoracic goiters are rare but the term is used to include those in which a considerable part of the goiter lies within the thorax. About 7 to 10 per cent. of all goiters fall within the latter category. Accessory thyroids in the thorax may become goiterous and be entirely separate from the thyroid proper but in the great majority of cases intrathoracic goiters are adenomas developing in either lobe or isthmus of the thyroid and gradually descending into the thoracic cavity. This descent is favored by the direction of growth of the tumor by the pressure of the muscles anterior to the thyroid by gravity and by the repeated dragging effect of inspiration on a low lying mass. In some cases the entire thyroid gland lies lower in the neck than normal—a condition of thyroptosis which may lead to intrathoracic goiter.

Because of the factors which tend to produce intrathoracic goiters, they most commonly occur in older people. Congenital goiters are sometimes found encroaching on the thoracic cavity to such an extent as to prevent respiration at birth. In the Pathological Institute in Bern, Switzerland there is a specimen of a congenital goiter which occupies nearly all of the thoracic cavity the lungs being flattened into thin sheets.

Two types may be recognized—the plunging and the fixed. In the former the goiter may be forced into the neck by more or less violent respiratory movements, such as coughing while in the latter the goiter remains in the thorax either because of adhesions or more commonly because of its size or position, it cannot escape through the upper outlet of the thoracic cavity.

The symptoms produced by intrathoracic goiter are mainly due to interference with respiration or the circulation of the blood, or due to the toxic effects of the goiter itself. There is often direct pressure on the trachea with resulting chronic dyspnea and cyanosis or portions of the lungs may be so compressed that expansion is limited. Wheezing, paroxysmal coughing, and dyspnea may simulate asthma, and the true condition of intrathoracic goiter remain unsuspected for a long time. The trachea may be flattened to a marked degree and with the absorption of tracheal rings from long-continued pressure there is the possibility of tracheal collapse, particularly after the supporting tissue is removed by operation.

The circulation of blood to the head and upper extremities may be much disturbed by intrathoracic goiters—even the superior vena cava may be completely blocked and the venous blood forced to return by way of collaterals to the inferior vena cava. One sees in these cases enormously dilated veins on the anterior chest wall.

Pressure on the aorta and its upper branches is not at all uncommon with deep-seated goiters, and it seems reasonable to ascribe some of the cardiac disturbances to that. Occasionally one finds unequal radial pulses when the goiter interferes with a subclavian artery.

*Toxic effects from the goiter itself are not to be overlooked.* The innocent adenoma is only innocent during its infancy—its maturity is early and its influence on the nervous system and heart is not a good one. A combination of toxic symptoms, referable particularly to the heart and nervous system together with evidence of intrathoracic pressure as shown by cough, dyspnea, or cyanosis, should always make us think of a toxic intrathoracic goiter.

Among other symptoms is dysphagia in a fair proportion of cases—*the patient cannot swallow food easily without taking* liquids at the same time. The dysphagia is usually from indirect pressure of the goiter through the trachea, while in other cases the goiter is in contact with the esophagus. Interference with the recurrent laryngeal nerve is quite often present but as

the pressure on the nerve is gradual in its onset, the vocal cords accommodate themselves and it requires a laryngoscopic examination to detect the paresis. The normal excursion of the

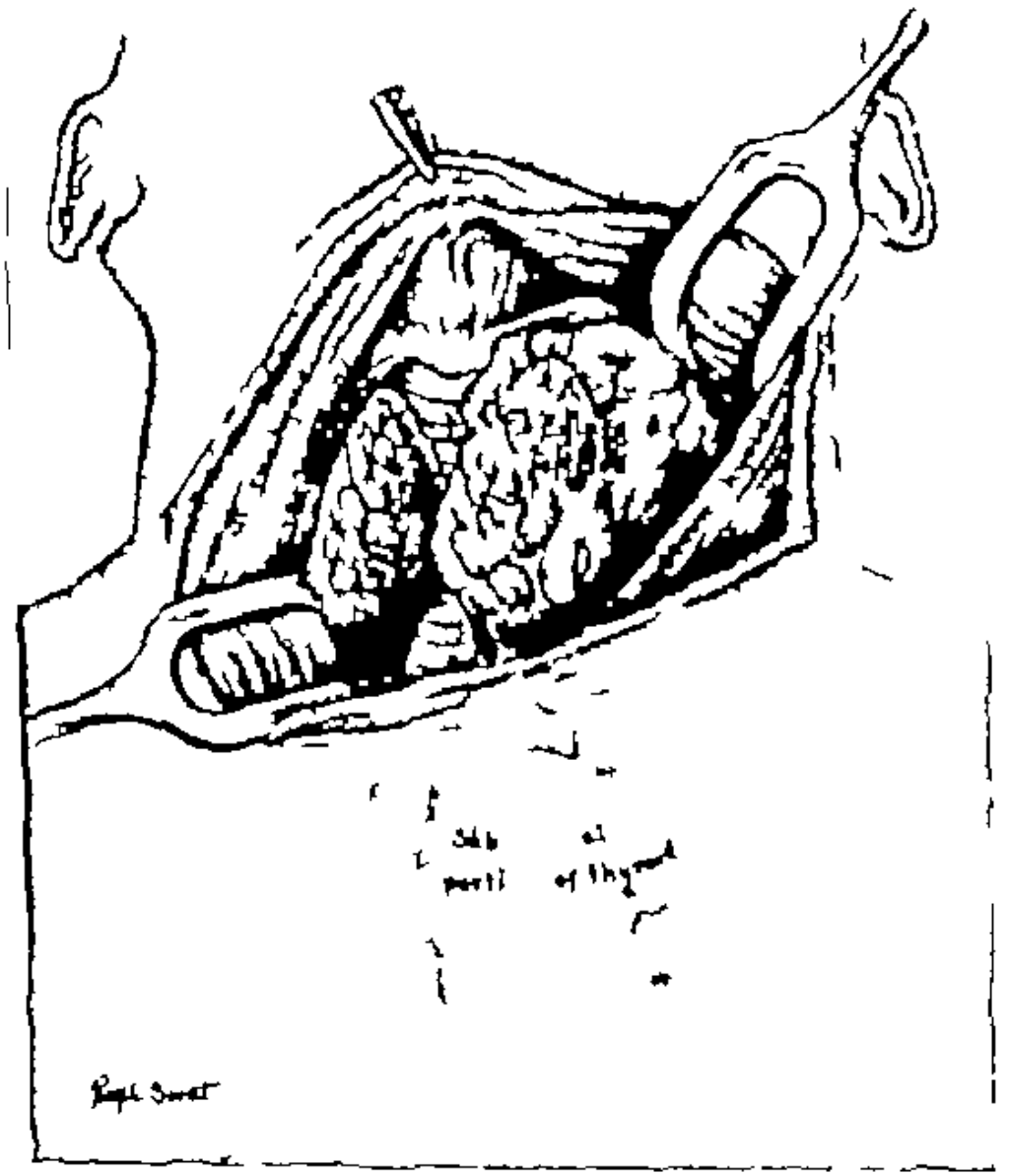

Fig. 203.—Exposure of goiter without division of muscles.

larynx may be inhibited by the fixation of the trachea by an intrathoracic goiter

The important diagnostic points of intrathoracic goiter are respiratory embarrassment, usually paroxysmal in character a sense of continued pressure in the upper part of the thorax

dysphagia distention of the superficial veins of the neck and upper thorax dulness on percussion in the sternal region a mass

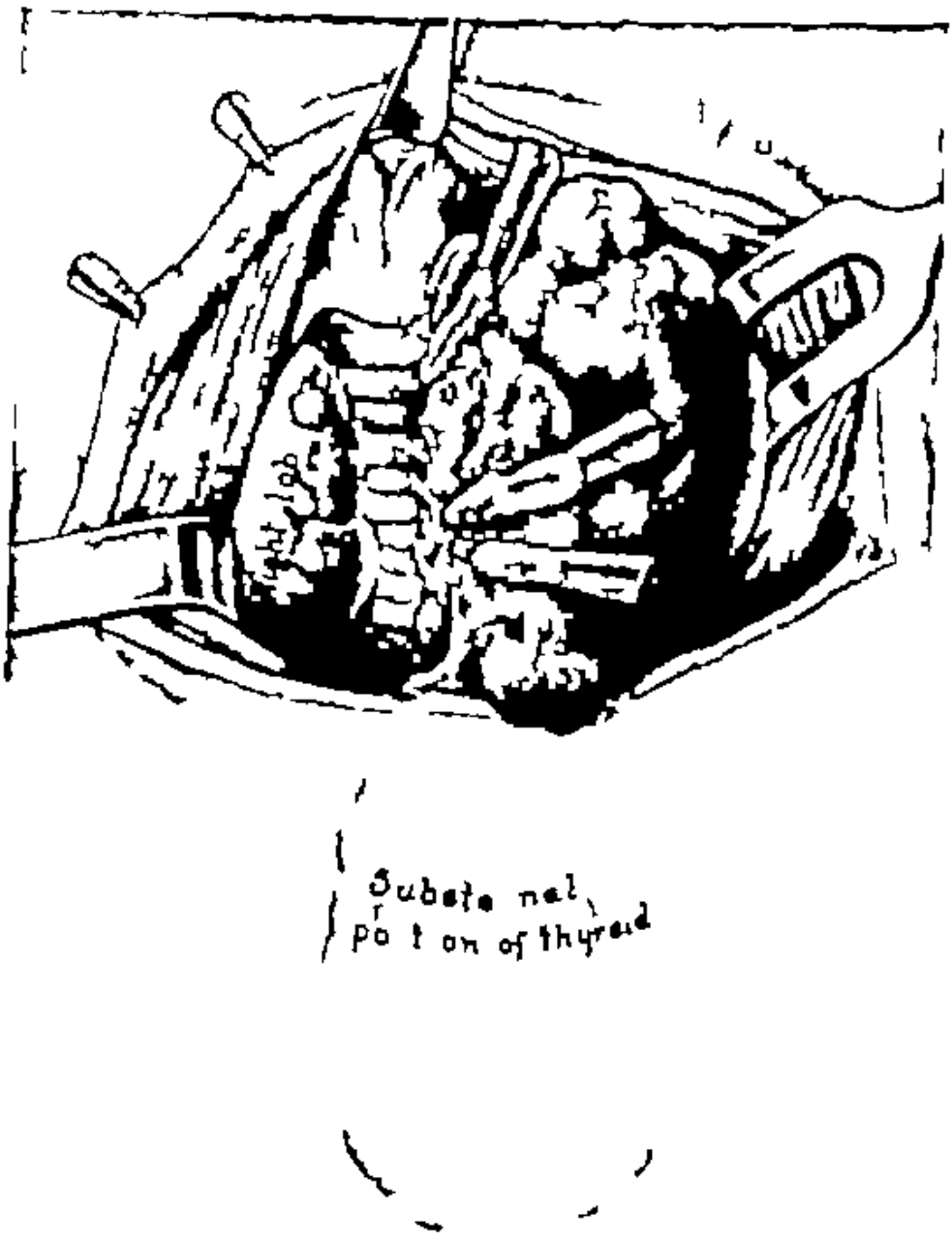


Fig 204.—Partial removal of goiter leaving connection with intrathoracic portion

in the upper thorax which moves with respiration as shown by the x ray deviation or compression of the trachea also evidenced by the x-ray inhibition of the normal movement of the

larynx paresis or paralysis of one or both vocal cords and finally the toxic symptoms of a goiter Some of the signs and symptoms may be found with other intrathoracic conditions such as mediastinal tumors or aneurysms. Goiters within the thorax usually rise on coughing to the level of the suprasternal

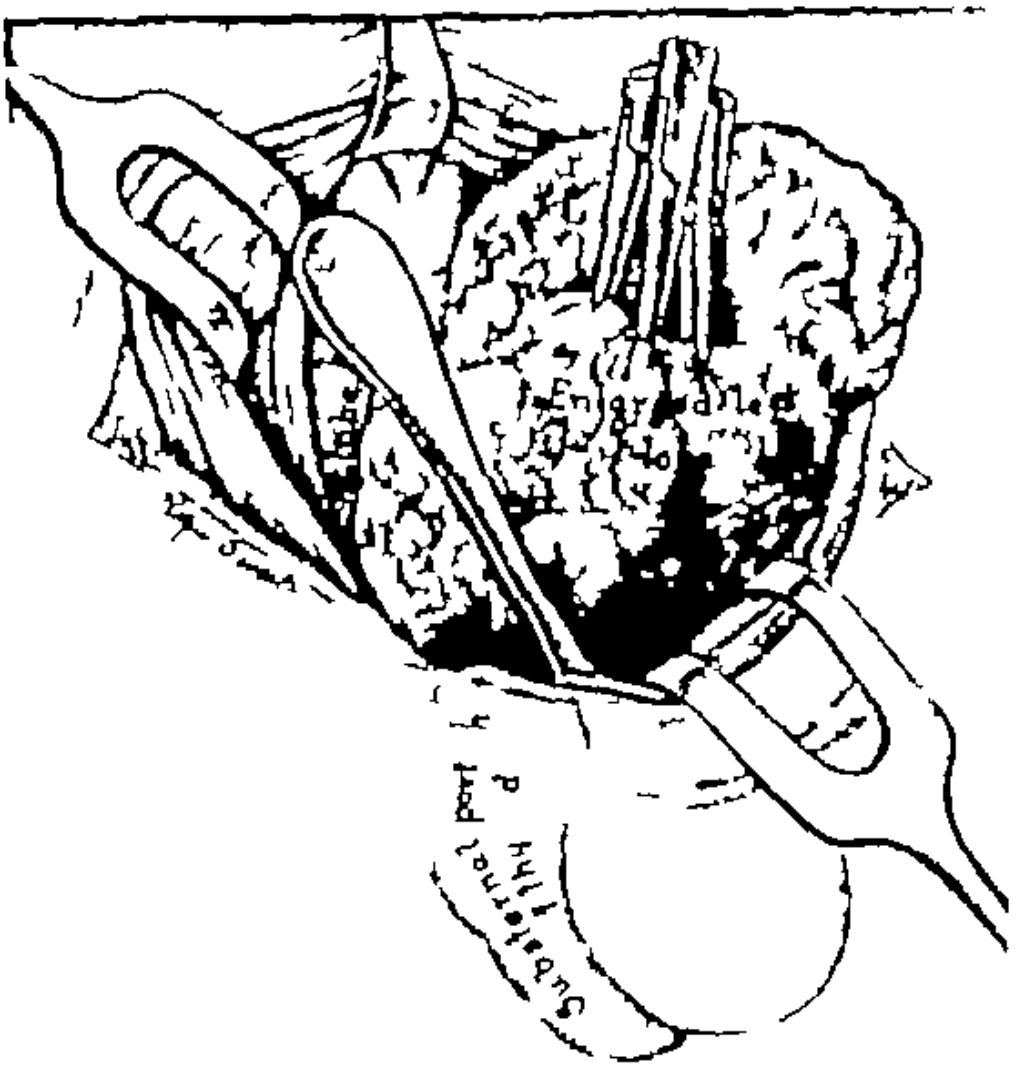

Fig 205.—Elevation of intrathoracic goiter

notch, and on palpation they will impinge on the finger during the cough. The dyspnea is usually worse when the patient is lying down, owing to increased pressure on the trachea Many patients are in the habit of sleeping in a semisitting posture.

The treatment of intrathoracic goiters is manifestly sur

gical. Treatment by *x*-ray should not be tried, because by far the great majority of them are adenomas, which are not favorably influenced by radiation, and there is the danger of producing hypothyroidism by the effect on the normal thyroid tissue.

The approach to these goiters should be the Kocher collar incision in or parallel to the normal folds of the neck and rather low down near the sternum. It is seldom necessary to divide the sternohyoid and sternothyroid muscles transversely if one dissects up the skin and platysma a sufficient distance. Should the goiter be so large that delivery from the thorax is impossible the sternum may be split longitudinally and the fragments wedged apart. After a thorough exposure of the thyroid region one usually finds the intrathoracic goiter connected with the cervical portion of thyroid by a narrow cylinder which is useful as a *tractor*. *It is usually advisable to do whatever may* be necessary in the neck, such as removal of other adenomas or ligations of vessels, before delivering the intrathoracic mass, retaining however the connecting cylinder if it be present. The blood-supply of the intrathoracic portion is usually from the inferior thyroid artery but there may be other anomalous vessels and hemorrhage may be severe unless promptly checked. These tumors are encapsulated and, in addition, there is usually pseudocapsule formed from fibrous tissue. *It is important to* get a line of cleavage in the right plane between the two envelopes, as thereby injury of large vessels or pleura or thoracic duct may be avoided. Separation along the planes may be effected by sweeping the finger around the tumor or a blunt curved instrument like a Kocher dissector may be used. Then, by traction on the pedicle aided by a soup-spoon, having a circular bowl as an elevator the tumor can usually be delivered *without much trouble*. *The plunging type of goiter may* be brought into the field by the patient coughing. On one occasion I had the anesthetist momentarily stop the flow of gas and oxygen, when the patient fortunately coughed and delivered the tumor. After the removal of the mass coughing may embarrass the operator by provoking hemorrhage or even rup-

turing the pleura, as instanced by Ochsner who now provides against the contingency by packing in a sponge.

The large intrathoracic goiters often tax one's ingenuity to extract them through the narrow outlet of the thorax. Evisceration of the contents by morcellation is attended by sharp hemorrhage, but by packing a strip of folded gauze firmly within the capsule and allowing it to remain a few minutes the smaller vessels will be closed and the larger ones can be picked up with hemostats. With the expansion of the lungs the greater part of the cavity is obliterated, but drainage of the remaining space is advisable contrary to my usual practice with neck goiters.

## CLINIC OF DR ERNEST W CLEARY

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# RESTORATION OF FUNCTION AFTER CERTAIN INJURIES OF THE EXTREMITIES

THIS discussion is concerned with problems of a sort frequently encountered in reconstruction surgery of the injured For illustration 11 cases are presented These fall into five groups. Roentgenograms of the cases in the first four groups are shown. No skeletal pathology was revealed by roentgenograms of the fifth group

The problems which will be touched upon are

I Delayed union the place and value of (*a*) immobilization, (*b*) physiotherapeutic modalities (*c*) active use (*d*) bone-grafts

II. (*a*) Considerations which should determine the choice for or against operation in certain unreduced, partially reduced or malunited fractures. (*b*) Should recent compound fractures be treated by bone-plating?

III The limitations of traction as a measure for restoring length in an old malunion with shortening

IV Application of traction in right-angled abduction to certain fractures about the shoulder joint.

V Recognition and treatment of adhesions limiting motion in the shoulder joint

### I. DELAYED UNION

**Case I.**—G W H. Age forty-nine. Sustained simple fracture of the right tibia and fibula at the junction of the middle and lower third and a second fracture of the right tibia at the junction of the middle and upper third June 20 1920 The fractures were reduced and a plaster cast kept on until August 20 1920 Inasmuch as union of the lower fractures had not occurred

on August 20th bone-grafts were put in both tibia and fibula and plaster cast applied.

When seen November 19 1920 this plaster cast had been on three months. There was no union f either tibia or fibula and evidence of some absorption of both grafts (Fig 206) The circulation of the limb was very poor there was marked atrophy of both calf and anterior muscle groups. The ankle was quite stiff with the foot in a position of marked equinus. The cast

Fig 206.—Case I G W H. Double fracture of he tibia De-layed union after bone-graft of lower tibial and of the fibular fractures

Fig 207.—Case I Complete union of both tibial and fibular fractures after course of physiotherapy

was removed the patient fitted with double-bar leg brace nd encouraged to put some weight n the foot, and vigorous physiotherapeutic measures, consisting in daily baking massage and tapotement with a rubber hammer were begun Firm union of both tibial and fibular fractures had taken place March 15 1921 (Fig 207) A tendon lengthening operation had t be done to correct the equinus

After sixty days immobilization without evidence f lon

in Case I the assumption that some further therapeutic measures were in order was justifiable. It is my practice to change immobilization in plaster for lateral support by means of a brace even earlier where there is not satisfactory evidence of callus formation. The brace is removed for daily physiotherapeutic treatments prescribed to stimulate the local circulation and reparative processes, by baking by hot baths or hot packs by massage, by Biers hyperemia (Hugh Owen Thomas called it 'damming' and used it at least ten years before Bier) by vigorous hammering with a rubber hammer over the fracture site, and by active use of the limb weight bearing if it is the lower extremity During all stages and phases of the treatment the site of fracture is carefully guarded against heavy lateral stresses or tortions.

Bone-grafting should be reserved until thorough conservative treatment has demonstrated that there is non-union instead of simple delayed union. The chance of a successful result from bone-grafting is much better where the tissues of the injured limb are restored to a condition approximating normal tone and vigor by a short course of such physiotherapeutic treatment as above outlined Cases of the type of Case I frequently recover under such conservative measures as above outlined without operative procedure I am of the opinion that much time would have been saved in the treatment of Case I if physiotherapy instead of surgery had been instituted at the stage when the bone-grafts were inserted or even some weeks earlier

## II. TREATMENT OF MALUNION

**Case II.**—E M Male fifty four oil well driller Sustained compound fractures of the middle third of the right radius and ulna, the radial fracture much comminuted, on October 6 1919 After three weeks in a splint the question of operative interference was raised on account of overlapping shown by the *x* ray (Fig 208) and the patient was brought to San Francisco

When the splint was removed inspection revealed no signifi-

cant swelling, discoloration, or deformity of the right forearm. There was a small scar from a recently healed wound on the flexor surface midway between wrist and elbow. The forearm was in neutral rotation. Callus was palpable over the site of both fractures. No attempt was made to manipulate the limb vigorously or to encourage active motion but some rota

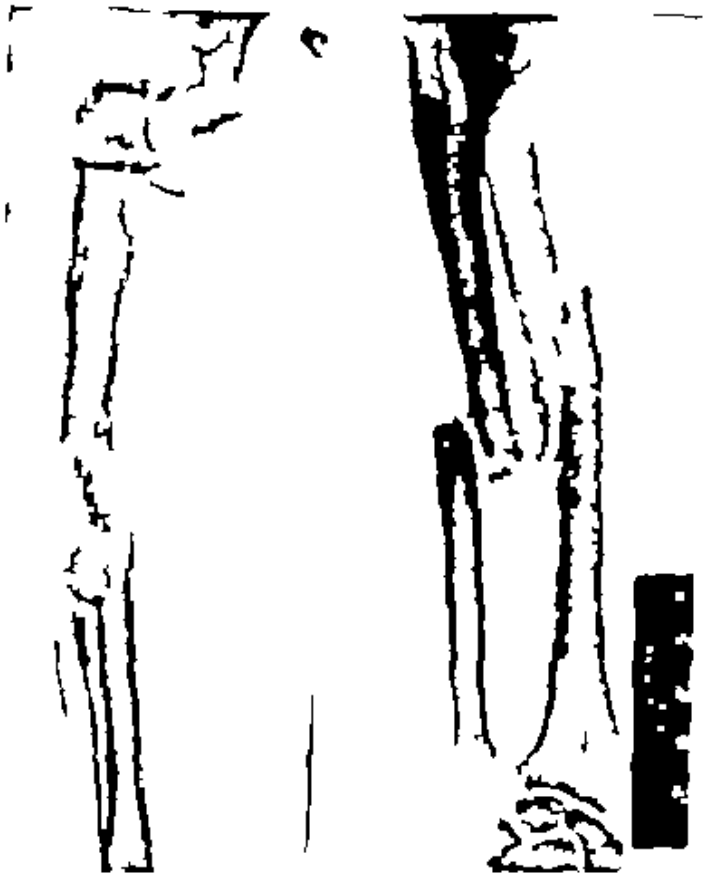

Fig. 208.—Case II. Roentgenogram three weeks after fracture of right radius and ulna showed discouraging derangement of bony anatomy but there was good functional recovery with the fractured bones in the positions shown.

tion of the forearm was observed. Union was taking place. The patient confessed no discomfort. *x* Rays showed a transverse fracture of the middle of the ulna and a comminuted fracture of the radius extending from the level of the ulnar fracture 2 inches toward the elbow. Position of radial fragments was good. The distal end of the upper ulna fragment was displaced radialward and toward the flexor surface over

lapping the lower fragment about ½ inch. There was extensive callus of both bones with the upper fragment very close to the radial callus The probability of a good functional result without operative interference was recognized The forearm was immobilized in a position of complete supination. The cast was removed November 29th. There was firm union of both fractures Definite rotation of forearm as noted Baking massage, and active exercises were begun at once. December 12th range of rotation was 90/145 and external appearance of forearm was normal. On January 3 1920 rotation of right forearm was 120/145 Grip was not significantly impaired Patient returned to his regular employment February 1 1920 Duration of disability four months.

Case III.—G W Male aged thirty three Concrete worker Sustained compound fractures of left radius and ulna June 19 1920 with considerable laceration, contusion and friction-burning of left forearm Both bones were plated one week after injury Infection resulted plates were removed and wires substituted a purulent discharge was constant The wires were removed about October 13th. Patient was transferred to San Francisco November 3 1920 Examination on that date showed the extensor surface of the left forearm flat from long application of a board splint. There was atrophy of the forearm and hand musculature No evidence of nerve lesion was noted except hypesthesia over the dorsum of the thumb and index finger The forearm was fixed in neutral rotation by bridge of bone between the radius and ulna (Fig 209) The wrist was in neutral position with fingers extended. A trace of motion was present in wrists and digits. Union of fractures was clinically rigid. Slight purulent discharge from sinuses leading to both radius and ulna was present Extensive scars were adherent to both radius and ulna and the circulation in forearm and hand was very poor Wassermann test was negative The splint was discarded at once. Sinuses were protected by small dressings physiotherapy was instituted, graduated from baking and light massage to heavier massage active and resistive exercises and passive manipulations as the

condition improved. All sinuses closed in approximately four weeks. Dorsiflexion of the wrist improved so rapidly that a cock-up splint was not used Flexion straps were applied to the fingers. Treatment was discontinued February 1 1921 Wrist and finger motion was *practically normal. Grip was* 40 (dynamometer reading) There were no clinical signs of

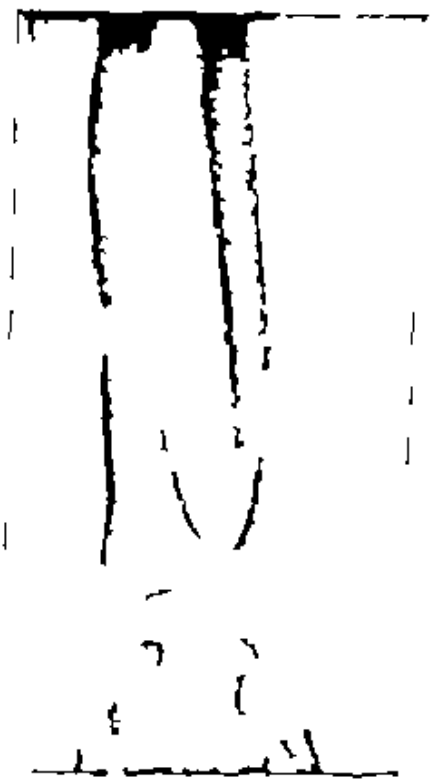

Fig 209—G W Imperfect union with infection sinuses, and interosseous bridge as the result of plating immediately after compound fracture. Plates removed several weeks before taking the radiograph

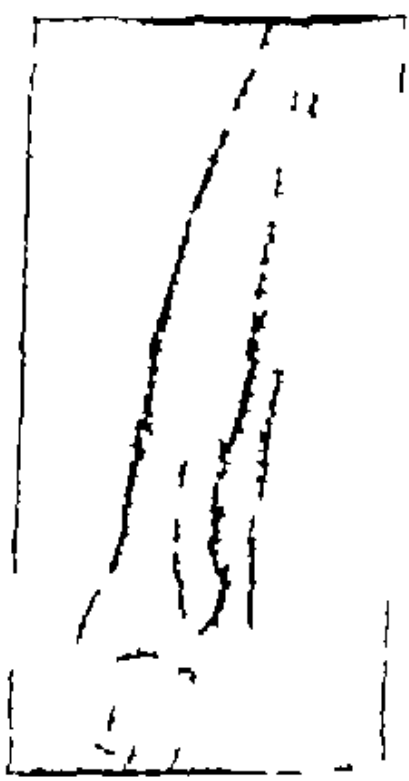

Fig 210—Case III One year later complete union and absorption of interosseous bridge after vigorous physiotherapy and several months active use

persisting inflammatory reactions about the sites of the old infections. Skin scars were still adherent to both bones. Forearm rotation was nil. Patient was advised to go to work and to report after six months for operative removal of bony bridge between radius and ulna. He reported for observation on April 13 1921 after working steadily firing boiler since March 10th. *He stated that* he had discovered that he could rotate

the left forearm a little. Examination showed about 45 degrees rotation possible *x* Rays showed some absorption of the bony bridge. He continued to work and reported for observation November 15 1921 *x* Rays were taken and showed almost complete absorption of the interosseous bridge (Fig 210) A plastic operation for removal of a small exostosis from the dorsum of the radius for freeing the skin from both ulna and radius at the sites of adherent scars was done November 17 1921 On December 1 1921 wrist and finger motions were normal Rotation of left forearm was 110/180 supination, 80/90 pronation, 30/90 grip of left hand 50 *Note* An old injury to right hand precluded getting the exact fraction for grip Duration of disability due to forearm injury two hundred and seventy six days.

Roentgenograms which show definite malposition of fractured bone ends, after conservative measures have been tried and after considerable time has elapsed since the injury have definite weight as evidence in determining whether or not operation should be done. Evidence on careful clinical examination that bony union is taking place without significant impairment of function should, however outweigh all other evidence and determine that the bones remain undisturbed by operation.

Skeletal deformity is not a sufficient basis for any dangerous attack upon a surgeon s reputation if it is counterbalanced by practically complete functional recovery If the outlook for functional recovery is poor then it is another story Roentgenograms are now almost as easy to secure as the popular stamp photographs were twenty years ago. Certain irresponsible venders of skiagraphs often throw in an opinion in which they seem prone to magnify the evils revealed by their art, as though seeking by the means of such sensational diagnosis to compensate the victim for the fee they charge him Hence it comes that, in the existence of marked correctable skeletal deformity coupled with anything less than practically perfect functional recovery the issue may be forced by the roentgenographic evidence Many an operation undertaken to improve a bad *x* ray picture has resulted in a less useful limb

Unfortunate results occur with particular frequency after the fixing of recent compound fractures by means of Lane plates or other metallic sutures. Rarely if ever is fixation of a recent compound fracture by the introduction of a foreign body such as a Lane plate justifiable The chance of carrying extensive infection into the bone by such an operation under such circumstances is great, and cannot be eliminated by any technic of which surgeons are possessed. Osteomyelitis is so serious a disaster that "safety first" should be the rule.

A surgeon may be so fortunate as to escape infection after bone-plating in a large percentage of recent compound fractures, but this good fortune does not make such practice good surgery Tragic results from the use of such methods are often seen. I am convinced that the average results of the most brilliant surgeon who plates recent compound fractures will, by his disastrous failures be brought far below that of the surgeon who efficiently employs the best non-operative methods.

Conscientious and intelligent use of the procedures of splinting traction, suspension, and lateral pressure developed through the World War experience secures in the average compound fracture of a long bone result that closely approximates the best that could possibly be obtained by bone-plating In the relatively few cases where operation upon a compound fracture is necessary for reasons other than to control already existing infection involving bone incision should be deferred until a clean field of operation is a reasonable possibility

In Case II the evidence of the roentgenogram was outweighed by the clinical findings operation was not done and practically complete functional recovery occurred notwithstanding uncorrected skeletal deformity In Case III compound fractures of the forearm bones were restored to anatomic reposition by immediat plating Infection ensued at the cost of much loss of time and much suffering to the patient with finally lesser degree of functional recovery than was secured in Case II This patient was fortunat enough to escape the tragically disabling result which I have in many instances seen as the aftermath of infection of a plated compound fracture

Case III is an interesting instance of absorption of a complete interosseous bridge between the radius and ulna. Absorption occurred late. Ability to rotate slightly was first observed about two months after return to active employment. It is to be noted that closure of sinuses and completion of bony repair both occurred after removal of all splints and after the patient had been given several weeks of physiotherapy

III. LIMITATIONS OF TRACTION IN CORRECTING SHORTENING

Case IV.—C. E. Male aged thirty-eight. Rancher. Sustained a comminuted subtrochanteric fracture of the left femur June 8 1918. Splint applied and patient kept in bed seven weeks. About on crutches until January 1 1919. Commenced doing chores about ranch in March 1919 walking with a cane. When seen for the first time September 20 1919 he was walking with a cane and had a very marked limp. Sharp inward angulation of the lower fragment of the femur at the site of fracture had resulted in adduction deformity and 3 inches shortening of the leg. Flexion of the left thigh was limited to 90 degrees of the left knee to 85 degrees. The circumference of the left midthigh was 1½ inches less than that of the right at the same level. *x* Rays showed malunion of old comminuted fracture of the femoral shaft about 1½ inches below the lesser trochanter and separation of the lesser trochanter (clinically fibrous union) (Fig. 211).

Patient was operated October 13 1919. Through a lateral incision two holes were drilled transversely through the center of the femoral shaft, the first just below the site of fracture and the second 3 inches distal. The anterior half of the femur was sawed through with a Gigli saw at the upper drill hole and the posterior half sawed at the lower drill hole. The intervening 3 inches of the shaft was partially split longitudinally with the Albee saw and the separation completed with a wide thin osteotome. The limb was abducted and the patient put up in a Jones abduction frame for six weeks. Heavy traction by means of a Spanish windlass, was maintained for five weeks upon adhesive strapping to the leg below the knee. It was

hoped by this procedure to reduce the shortening by pulling down the lower fragment. *x* Rays showed that this was unsuccessful. *Massage of the thigh* was begun in the sixth week. Treatment by hot packs massage, and graduated active exercises was given. Patient was discharged March 24, 1920. On the date of discharge shortening of the left leg was 1½ inches. Flexion of the right knee was possible through 100 degrees. There was slight lateral mobility of the knee in a position of full extension.

Fig 211.—Case IV. C. E. Union of subtrochanteric fracture of left femur with overlapping and adduction deformity.

Fig 212.—Case IV. C. E. After long osteotomy and five weeks traction. Adduction deformity corrected, but no additional length gained by traction.

During the World War many cases of malunion of fractures of the long bones with overlapping and shortening were corrected by careful and persistent traction. There are records of cases of fracture of the shaft of the femur with malunion and several inches of shortening which were restored to normal length by several weeks of continuous traction in the Thomas splint, or by use of so-called "ice tongs" for direct traction upon the bone. Two fundamental conditions necessary to success in any case

so treated are (1) that non-union exist and (2) that traction by whatever method be efficiently maintained.

Case IV presented a problem of malunion of a femoral fracture with 2 inches of shortening due to overlapping and malalinement. The bony union had been complete for over eight months when operation was undertaken. It was thought that possibly in addition to the length gained by correction of the angulation the shortening might be further reduced by doing a long osteotomy and pulling down the shaft fragment by heavy continuous traction maintained until bony union occurred. The patient co-operated well and heavy integral traction was maintained by means of the specially fitted Jones abduction frame and a Spanish windlass for five weeks. At the end of that period there was bony union and the x ray showed that no length whatever had been gained by traction (Fig 212)

In my opinion the principal reason why traction resulted in no further gain in length was that the shortened adductor muscles were already stretched very taut through bringing the leg into abduction, before traction was instituted By measures of direct traction with caliper tongs a sufficient force could possibly have been exerted to reduce the shortening The experience in this case, however has convinced me that where shortening has endured long enough to permit the adaptation of so powerful a muscle group as the thigh adductors to a much restricted range ordinary methods of traction will not avail to restore length to the limb

### IV ABDUCTION-TRACTION IN FRACTURES INVOLVING THE SHOULDER JOINT

Case V—A. R. Male aged fifty five. Woods superintendent. Sustained a comminuted impacted fracture of the head of the right humerus with very severe contusions of the soft parts September 13 1920 When seen September 17 1920 he had his right arm bound to his side It was intensely swollen and bluish-black in color from elbow to shoulder He was anesthetized and the right arm placed in abduction-traction splint. Traction was maintained until October 14th. Physio-

therapy was begun October 13th. The splint was retained until October 24th, when the patient was suddenly taken with very severe pleurisy The splint was removed, physiotherapy suspended, and the arm allowed to come down to the side of the body Physiotherapy was begun again after ten days. The arm was found very stiff and sore and abduction hard to regain. Treatment was continued until March 7 1921 On dismissal there was ¾ inch shortening from acromion to olecranon. The

Fig 213.—Case V A. R Fracture of surgical neck of right humerus with some comminution of head. Maximum of scapulohumeral abduction regained Angle of humeral shaft with lateral border of scapula 80 degrees

Fig 214.—Case V A R Showing position of maximum abduction Angle between shaft and lateral border of scapula 30 degrees A comparison with Fig 213 shows 50 degrees scapulohumeral abduction range.

range of motion in abduction and adduction in a lateral plane was from 15 degrees from side of body to 110 degrees from side of body Patient could place the tip of the right index finger on the middle of the opposite clavicle, on the spine of his fifth cervical vertebra, and in his right hip-pocket X Rays indicated that further motion between the scapula and humerus was probably inhibited by bony obstruction A measurement of the angle made by the shaft of the humerus with the lateral

border of the scapula in the two x rays showed the arc of scapulo-humeral motion in lateral abduction to be between 45 and 50 degrees (Figs. 213 214)

Case VI.—J L. Male aged fifty three. Carpenter Fell 20 feet, sustaining comminuted, impacted fracture of surgical neck and head of right humerus, with extensive contusion of soft parts about the shoulder on March 30 1920 He was treated by traction in an abduction splint at right angles from the side of the body for five weeks. Massage was begun in the fourth week and followed by a carefully graduated course of active and resistive exercises. On August 23 1920 there was ¾ inch of shortening of the arm from acromion to olecranon. Motion was normal except for slight limitation of internal rotation. (Hand could be placed behind back not higher than the level of the lumbosacral joint) On January 19 1921 he reported for observation after working several weeks at carpentry He complained of some weakness, soreness, and cramping of the right shoulder muscles. Vertical abduction was limited to 135 degrees. The full range on the uninjured side was 155 degrees January 9 1922 Abduction was normal Internal rotation was limited as above described. There was no longer any manifestation of pain or weakness. The roentgenogram showed abduction of the shaft with some overlapping at the site of fracture (Fig 215)

Case VII.—B H. Male aged eighteen. Laborer Fell 17 feet, striking on his left shoulder sustaining a comminuted fracture of the surgical neck of the left humerus, with anterior displacement of the upper end of the shaft on August 6 1921 When seen August 10th his left arm was bound down to his side Attempts at reduction had been unsatisfactory The patient was too small to be fitted with any abduction traction splint available. He was put up in a cast, in traction, at an angle of 110 degrees with elbow flexed to a right angle and arm in neutral rotation. On account of pain cast had to be cut, releasing to some degree the traction on the humerus. The cast was retained for four weeks. Physiotherapy was begun and carefully graded up from hot packs and simple massage to

therapy was begun October 13th. The splint was retained until October 24th, when the patient was suddenly taken with very severe pleurisy The splint was removed, physiotherapy suspended, and the arm allowed to come down to the side of the body Physiotherapy was begun again after ten days. The arm was found very stiff and sore and abduction hard to regain. Treatment was continued until March 1921 On dismissal there was ¾ inch shortening from acromion t olecranon. The

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the body heavy traction being maintained during the application of the cast. In each of the 3 cases the forearm was held in a position of right-angled flexion in a horizontal plane that is to say in neutral rotation of the shoulder In each of the 3 cases the degree of injury to the soft tissues about the shoulder was extensive. This was especially true of Cases V and VI in each of which the swelling was extreme and the entire injured shoulder and upper arm in each case bluish black from extensive extravasation of blood. It will be noted that in both Cases V and VI the action of the pectoralis major the teres major and the latissimus dorsi on the upper end of the lower fragment resulted in pulling the end down, so that union took place with definite abduction deformity (see Fig 215) Notwithstanding this deformity Case VI regained a range of motion of the shoulder practically normal in every respect, except that internal rotation was limited so that the hand could not be placed upon the back higher than the fifth lumbar segment.

In Case V the injury to the shoulder joint was most marked such a case as would, if treated without traction and in an adducted position, probably have resulted in a complete loss of scapulohumeral motion. The patient had the misfortune to suffer a severe pleurisy which interrupted physiotherapeutic treatment for ten days at a critical period in his convalescence Notwithstanding this mishap and the conspicuous angulation at the surgical neck, caused by the downward pull of the pectoralis, teres major and the latissimus dorsi, the patient recovered with between 40 and 50 degrees of scapulohumeral abduction and with both internal and external rotation better than 50 per cent. normal range (see Figs. 213 214) A considerable portion of the final limitation of motion in this case was attributable to a definite shortening of the latissimus and pectoralis major This had the effect of inhibiting the full range of scapular rotation and of abduction due to rotation of the scapula. The fact that, notwithstanding the very considerable limitation the patient was able to place the tip of his right index finger over his fifth cervical vertebra on the center of the opposite clavicle and in the right hip pocket of his trousers, evidences that the

vigorous Indian club swinging hanging and weight and pulley exercises. He was discharged from treatment November 7 1921 On discharge there was ½ inch shortening of the arm from olecranon to acromion and slight weakness of the right shoulder muscles. The range of motion was normal. The roentgenogram showed slight adduction and lateral displacement of the shaft at the fracture (Fig 216)

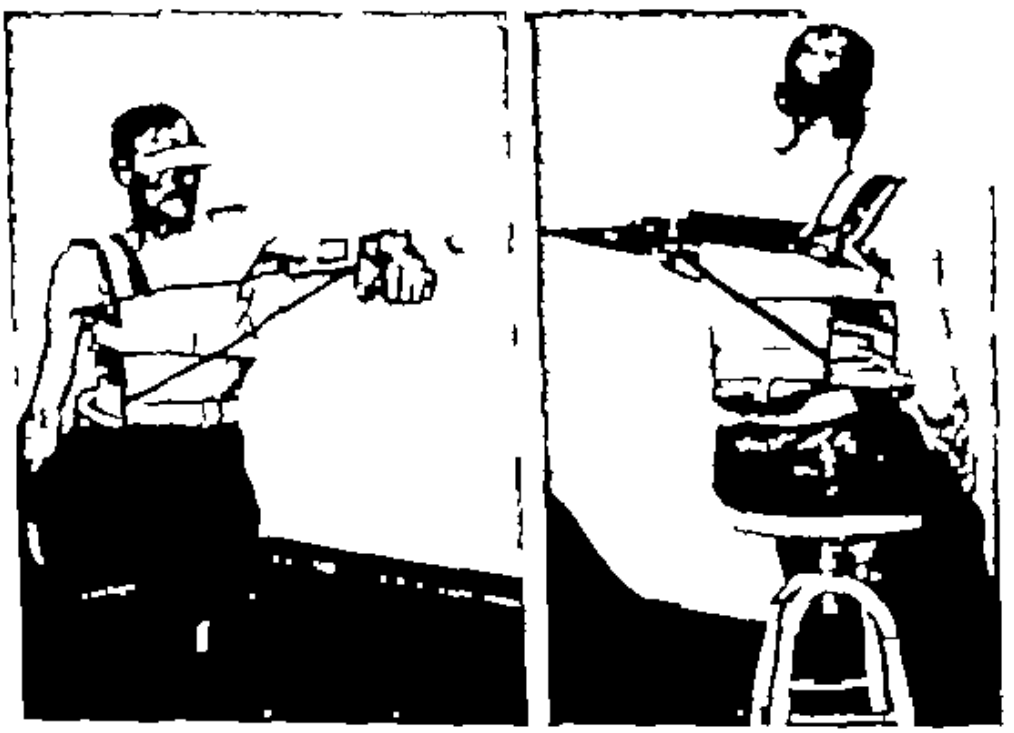
The treatment of fractures involving the head of the humerus by fixation in a position of adduction at the side of the body not infrequently results in scapulohumeral ankylosis. Quite often,

Fig 215—Case VI J L Showing deformity after treating case of surgical neck of right humerus in traction in right-angled abduction Range of motion practically normal

Fig 216—Case VII B H After treating fracture of surgical neck of left humerus in 120 degrees abduction in plaster cast Range and degree of motion not appreciably impaired

notwithstanding that excellent apposition and fixation of fragments is secured by this method, a large degree of permanent loss of function results The realization that poor functional results were so often the outcome of the treatment of such fractures in adduction led to the trial of the traction abduction treatment Four very severe cases of fracture of the surgical neck Cases V and VI were both treated by traction in an abduction splint (Figs 219 220) Case VII being too small to be fitted with any abduction splint available was put up in a plaster cast at 120 degrees abduction from the side of

work it is probable that strength tests, taken at intervals, would show a slight degree of general weakness in shoulder function persisting over a very long time. It is likewise probable that the degree of bony deformation would place some of the smaller shoulder muscles at sufficient mechanical disadvantage to cause these muscles to tire out quickly under continuous exertion. These cases are not presented as a plea for the abduction-traction method, but simply as illustrations of the possibilities limitations and results of the use of this method in such cases. In view of



Figs. 219, 220.—Showing front and back views of traction abduction splint applied.

the very poor functional results frequently noted following treatment of severe shoulder injuries in adduction the possibilities of the abduction-traction method make its use in all cases where the lesion threatens to result in scapulohumeral ankylosis justifiable.

The detailed construction of the abduction splint (Figs. 219, 220) has been described in a previous article. The splint is equipped for traction by adding a padded axillary belt and by extending the lateral bar of the forearm piece about 4 inches so

motion recovered was in the range of the greatest practical usefulness.

In Case VII bony deformity occurred by upward instead of downward displacement of the upper end of the humeral shaft (see Fig 216) This was probably due to the greater degree of abduction maintained and to the use of a cast which gave a firmer axillary support than the abduction splint. It is to be noted that the greater the degree of abduction above a right angle the more the pull of the pectoralis and the latissimus on

Figs 217 218.—Case VII. B H Showing range of motion of left shoulder three months after fracture of the surgical neck of the left humerus.

the shaft is converted into end thrust, and the less is the tendency to abduction angulation at the fracture from muscular pull. The photographs of Case VII (Figs. 217 218) show the range of motion regained in internal rotation and in vertical abduction.

Measured from acromion to olecranon, each of the 3 cases had about ½ inch of shortening none had any of the weakness of the deltoid so marked and persistent after the treatment of severe shoulder injuries in the adducted position.

After such cases as VI and VII have returned to regular

70 degrees from side of body very slight rotation possible motion almost entirely scapular *x* Rays showed transverse fracture through body of scapula about 1 inch below the lower border of the glenoid, united with some overlapping

Diagnosis Adhesions in the shoulder joint.

Treatment Manipulation under anesthesia heavy adhesions broken up followed by abduction splint and physiotherapy as in Case IX Discharged August 30 1920 with range of motion fully regained Patient still complained of some pain on abduction above an angle of 110 degrees from the side of the body

**Case X.**—J C Male aged fifty-six. Mine foreman. Slipped and fell November 23 1919 striking on his left elbow and wrenching his left shoulder Had a sensation of weakness and numbness in the shoulder Diagnosis of arthritis made and all his teeth extracted. No other treatment On June 18 1920 he came complaining of pain in left arm and shoulder and of inability to abduct the arm laterally more than 45 degrees from the side of the body There was definite atrophy of the deltoid and almost complete loss of motion between the scapula and the humerus. *x* Rays showed no pathology

Treatment (June 24 1920) Manipulation under anesthesia. The snapping of adhesions was audible across the room. Abduction splint was followed by physiotherapy as in Case VIII. Dismissed from treatment August 20 1920 Range of motion practically normal still some soreness and weakness. Reported for observation October 14 1920 Recovery complete

**Case XI.**—J D Male Laborer Fell 14 feet, striking on concrete floor on right shoulder and back October 8 1921 Severe contusion of right shoulder no special treatment given. Condition when seen November 21 1921 active and passive abduction of right shoulder limited to 90 degrees from side of body by adhesions Pain and muscle spasm on attempts to abduct the arm further *x* Rays November 21 1921 reported "No Roentgen evidence of pathology Heavy adhesions broken up by manipulation under anesthesia November 22, 1921 Physiotherapy begun November 25th Patient discharged with recovery practically complete on November 30 1922

as to give room for traction straps and Spanish windlass between this bar and the flexed elbow

V ADHESIONS IN THE SHOULDER JOINT

Case VIII.—F B Male. Garage worker Sustained an injury to his right shoulder December 7 1920 Fell 5 feet, caught right elbow on a wall, producing an upward thrust on the shoulder joint. Had severe pain in shoulder joint was strapped with adhesive plaster diagnosed subdeltoid bursitis returned to work after four days slipped and wrenched the shoulder again ten days later He was treated by adhesive strapping high frequency and active exercises. Complaint, when seen May 3 1921 pain on all extremes of motion in right shoulder severe pain at night Inability to abduct shoulder to a right angle Physical examination of right shoulder showed slight atrophy of deltoid and of supra and infraspinatus. Both active and passive lateral abduction limited to 75 degrees from side of body external and internal rotation both limited pain on palpation over anterior portion of joint capsule. *x* Rays of shoulder negative.

Diagnosis Adhesions of capsule after trauma

Treatment (May 6, 1921) Patient anesthetized and arm brought to vertical abduction with scapular motion controlled by assistant. Snapping of adhesions could be both felt and heard during manipulation. Arm fixed in right-angled abduction splint for ten days Baking and massage with graded active exercises begun and continued for five weeks At the end of this time range of active motion in shoulder was normal and patient complained only of occasional twinges of pain at night

Case IX.—S. B Male aged forty-eight. Oil well driller On February 24 1920 received an electric shock and was thrown heavily to the floor fracturing the right scapula and severely contusing the shoulder Arm bound to his side for four weeks After that treated by baking massage and active exercise for two months. Condition of right shoulder on June 11 1920 definite atrophy of right deltoid lateral abduction limited t

severe reaction occur or a definite weekly gain in range of motion fail to take place conservative measures are promptly abandoned and the adhesions are broken up under anesthesia. With increasing experience in the conservative method of treatment, excision of bursæ has become necessary in only a very small percentage of cases.

Support in right-angled abduction is the surest means of guarding against troublesome adhesions in an inflamed shoulder We use the abduction splint as a routine for prevention of adhesions after recent injuries and after breaking up adhesions by manipulation.

As a criterion for deciding when the abduction splint may be dispensed with we use the patient's ability to raise his arm in active abduction sufficiently to clear the splint. Applications of heat and massage are usually begun on the third day after manipulation. Physiotherapeutic treatments are continued until vigorous active abduction is performed throughout a practically normal range

Some cases, as Case XI, for instance, recover completely within a few days after manipulation. Others, like Case VIII, require a much longer period of treatment Cases complicated by a definite subacromial bursitis or by a shortening of the pectoralis major or teres major are likely to be very slow and take months rather than weeks of treatment before the maximum degree of recovery is obtained. There are of course cases where excision of the bursa or bursæ is advisable. Many cases of definite bursitis subside after adhesions are broken up

It is, of course possible to break up adhesions by forcible abduction without anesthesia. I consider this method unnecessarily cruel and uncertain as to results in the hands of anyone other than a master surgeon such as Sir Robert Jones. If more gentle and conservative measures do not result in a gradual but definite progress toward recovery then manipulation under general anesthesia is the safer alternative.

No apology is made for presenting a series of cases so simple as *shoulder adhesions*. Instances where disability has persisted and adhesions in the shoulder joint have been unrecognized as the cause for periods varying from a few weeks to one or more years occur too often. I have not opened a shoulder capsule showing adhesions but from clinical observation it is my opinion that *in addition to the bursal lesions so carefully* described by Codman, Brickner and many others, adhesions of synovial surfaces occur either where the capsule is folded upon itself or where it lies against the synovia-covered articular border of the bone. Obviously the latter mentioned condition might be expected to occur in the upper and outer portion of the shoulder joint capsule with the arm hanging at the side while in the axilla, adhesions of opposed folds of the capsule would be the rule.

Adhesions limiting motion in the shoulder joint occur very frequently after trauma of all degrees of severity Fixation with the arm at the side or even voluntary failure to raise the arm through the upper range of abduction for several weeks *after the injury favors the formation of adhesions* which limit abduction.

Subdeltoid, subscapular or subcorocoid bursitis may one or all complicate the clinical picture. Sometimes the surgeon, impressed by the symptoms and signs recognized as typical of subacromial bursitis in particular may fail to recognize the presence of adhesions unrelated to the bursa. Adhesions too dense to be stretched or broken up by the application of exercise and *manipulation without anesthesia are simply irritated* and made worse by such manipulation. By ill-advised physiotherapy a chronic reaction in one or more bursæ may be developed. It is our practice to try the effect of conservative treatment by hot packs, massage stretching manipulation and exercises in every case of shoulder joint adhesions which comes to our care without history having had a course of such treatment In treating such cases the reactions of soreness and muscle spasm *are carefully watched* and frequent measurements of the range of motion of the injured joint taken Should

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## VI. SUMMARY

1 In delayed union of fractures physiotherapy is valuable. Immobilization should not be too long relied upon exclusively Bone-grafting should not be considered until after vigorous and prolonged physiotherapeutic measures, failing to secure union, have at least restored the circulation and soft tissues to the best practicable condition.

2. (*a*) Degree of functional recovery and not roentgenographic evidence of reduction and alinement should be the criterion for decision as to the expediency of operative measures in fractures uniting in imperfect anatomic reduction. (*b*) Bone-plating recent compound fractures subjects the patient to an unjustifiable hazard. Such operations should be abandoned for the safe and adequate procedure of reduction and fixation by external splinting with traction, suspension, and adjustable lateral pressure pads.

3 Effort to restore length through stretching the soft tissues by integral traction failed in a selected case of malunion of the femur with marked shortening of many months duration The conclusion is that traction by ordinary methods is inadequate to stretch large muscle groups which have for a long time been shortened.

4 Traction in a position of right-angled abduction secured good functional results in cases of fracture of the surgical neck of the humerus complicated by severe soft tissue trauma. Some anatomic malalinement of the fractures occurred in every case In view of the frequent bad functional results from other methods the abduction-traction method is worthy of thorough trial.

5 After trauma to the shoulder joint adhesions limiting motion are common. Treatment by support in right-angled abduction is the best preventive Adhesions are often accompanied by bursitis (subacromial subscapular or subcorocoid) and are frequently undiagnosed. If such adhesions do not yield to conservative physiotherapy forcible manipulation under anesthesia, followed by a further course of physiotherapy usually leads to early recovery

# CLINIC OF DR. ALSON R. KILGORE

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## PREPARING A WOUND FOR SKIN-GRAFTING

BOLD indeed is the surgeon who advocates a new method of skin-grafting. Certainly the man who would improve on Thiersch grafts exposed to the air until "taken" must be a genius. But experience has forced upon my attention the great value of one bit of procedure which does not seem generally recognized, namely the application of paraffin (or ambrine) dressings a few days before grafting a granulating wound.

The condition of the surface to which they are applied is the deciding factor in the success or failure of skin-grafts. A soft, smooth-surfaced clean granulating wound allows the grafts to adhere promptly to it and derive immediate nourishment—a bubbly hard or dry granulating surface tends just as surely away from success. Granulating wounds dressed with ordinary dressing materials have bubbly hard surfaces, those dressed with paraffin are soft, thin surfaced, and smooth.

The procedure followed is this: The surface to be grafted is dressed with paraffin (or ambrine) three days in succession.

A satisfactory formula is this:

| | |
|---|---|
| Low melting-point paraffin | 23 |
| High melting-point paraffin | 70 |
| Yellow vaselin | 6 |
| Eucalyptol | 1 |

There are three essential points in the use of paraffin dressings for any wound (burns or other): (1) The material must be hot. A camel's-hair brush is just as satisfactory as a special atomizer is just as painless, much cheaper and does not get out of order. If a brush is used the paraffin should be heated in a water bath and the entire water-bath brought to the bedside. If the paraffin is heated over a flame without a water-bath it gets too hot, and if the dish of paraffin be removed from the water-bath it will cool too quickly and

to the wound in the usual manner leaving 2 or 3 mm. space between edges. The wound is left open to the air for three days usually with a wire cage protection. At the end of three days a paraffin dressing is applied across grafts and scabbed discharge without any attempt at cleaning. Twenty four hours later all the dried, crusted discharge comes away with the paraffin dressing and a little wiping with pledgets of cotton leaves a clean healthy grafted wound.

So much for theory and method. The procedure works admirably in practice. Much of the technic was literally forced upon us in caring for Miss H. a graduate nurse who turned suddenly in an operating room, knocking a burning alcohol lamp over and spilling its contents down her back with resulting third degree burns of both buttocks thighs and calves. The shock and continued absorption from her wide granulating areas kept her pulse at 140 and her stomach nauseated for weeks, so that cureting the wounds and applying grafts under general anesthesia was out of the question. Nor were Dakin's solution or other similar attempts to clean the wounds tolerated. Finally in desperation, small Thiersch grafts taken with novocain were tried and proved uniformly successful. A hundred grafts were applied to the back of a thigh at one sitting without discomfort or fatigue on the part of the patient, and with an average of better than 95 per cent. takes.

The case of V. H. illustrates the value of paraffin as a preparation of granulation tissue for grafts. Large granulating wound following gunshot gutter wound of thigh. The wound was first dressed with Dakin's solution until free from pus and immediately grafted as described without preliminary paraffin dressings. Result—one graft out of forty-eight successful. The following week the wound was dressed with paraffin three successive days and again grafted in identical manner. Result—forty two out of forty five grafts took and the wound was completely epithelialized within eight days.

M. L. M. is a steamship captain who has been under severe strain during a long stormy trip and developed an enormous carbuncle of the neck. It was excised three weeks ago. For

On the *fourth day small Thiersch grafts* ½ to 1 cm. in diameter are taken under novocain anesthesia from a convenient spot with a safety-razor blade held in a *hemostat* ½ per cent. novocain solution is injected with a fine needle *intradermally* so as to make a wheal 8 or 10 mm. in diameter Inserting the needle again intradermally through the edge of the wheal, its area is extended, and by thus adding a succession of wheals an area is outlined not more than one-third to one-half the size of the wound to be covered with grafts. The center of this skin outlined with wheals is then anesthetized by injecting novocain under it, introducing the needle through the line of wheals already produced. The patient should be unaware of any needle insertion after the first.

*For uniform success the grafts should be thinner than half* the thickness of the skin. They are placed in a bowl of warm salt *solution and the denuded area temporarily dressed with a* dry gauze. A generous vaselin dressing is prepared to replace this gauze after the remainder of the operation is completed, by which time bleeding will have ceased. If a vaselin dressing is not applied subsequent dressings of this denuded area will be extremely painful.

The grafts having been taken asepsis may be dispensed with. The paraffin dressing is removed from the surface to be grafted, the discharge which always forms under paraffin dressing is wiped away with cotton pledgets care being taken to void bleeding. A tissue forceps grooved director or other *blunt-edged instrument is then very gently used t scrape off* the thin film of slough-like material which will be found covering the granulations Care should be taken not to start bleeding The grafts are then spread out upon a finger and pplied

luck rough coating of paraffin ill result (2) The paraffin must be painted well out over normal skin at the edge of he ound If his is neglected he dressing sticks to he granulating edge and removal painful 3 A layer of cotton is placed over he first coat of par ffin and another oa of paraffin applied, sinking both coats nd he cotton into one reinforced la er The cotton must be extremely hin A bit he pinch of co on ved out until it ill barely hang ogether If hicker layers of cot on are used luck, heavy dressings result, luck crack easily and are uncomfortable

## A BETTER PLAN OF APPROACH FOR FEMORAL HERNIA

THERE are two ways in which the sac of a femoral hernia may be approached—either from above or from below Poupart's ligament. The approach from below Poupart's is employed in the familiar operation of Coley. The hernial sac is directly exposed to view, freed from surrounding tissues, opened, contents reduced, and the sac clamped and ligated at its neck, drawn down through the femoral canal. In this old and familiar operation the hernial opening is obliterated usually by a purse-string suture applied from within the canal to the under surface of Poupart's ligament and then to the sides and floor of the canal. The procedure is a good one and satisfactory in its results.

But a much more satisfactory obliteration of the hernial opening in the femoral canal can be accomplished from above Poupart's ligament. The operation is that proposed by Dujarier and in this country by Seelig and Tuholske. The inguinal canal is exposed by separating the fibers of the external oblique aponeurosis; the cord and its accompanying structures (or the round ligament) are carried aside with the free edge of the internal oblique by retraction or are held out of the way by a tape passed under them. This exposes the upper end of the femoral canal with the hernial sac entering it. The peritoneum is opened a short distance from the neck of the sac, and the sac is inverted by passing a forceps from within the peritoneum through the neck of the sac, and with it grasping the sides or fundus of the sac. The inverted sac is then ligated and excised from within the peritoneum and the stump so disposed that it will not act as a button tending to reproduce the hernia. Obliteration of the hernial opening is neatly and easily accomplished by approximating with interrupted sutures Poupart's ligament (or the roof of the canal) and the fascia over the pubic ramus ( Cooper "ligament"—the floor of the canal).

eleven days the wound was dressed twice daily with Dakin's solution packs until the granulation tissue base was nearly level with the surrounding skin. Followed three days of paraffin dressings. Then small Thiersch grafts, left open under a cage three days and again dressed with paraffin. Now three weeks after excision of his carbuncle, an area the size of a man's palm is epithelialized and he is to take out his skip tomorrow.

Mrs. D. R. has spent six months in bed, first with typhoid fever then with neuritis and temporary paraplegia, now just beginning to clear up. She obtained (in another hospital fortunately) bed-sores over the sacrum and over each hip, going down almost to the bone. Three weeks of scrupulous care and dressings with dichloramin-T have made only the very slightest impression on the size of the sores. At the evident rate of healing a year would elapse before closure. A week ago the sore over one hip was paraffined, then grafted as described. Eleven grafts were applied, and today seven have taken and are in excellent condition, and two-thirds of the deep granulating surface of this sore will be covered within another week.

The method, therefore, is ideal not only for burns, but for various other granulating surfaces. Its great advantage is that by it surfaces can be covered regardless of infection and amount of discharge as soon as granulations begin to form, thus conserving valuable time and reducing scar tissue contracture. Old granulating areas also may be covered without recourse to curetting under an anesthetic.

opening with sharp fascial edge incarcerated contents or contents widely adherent in the sac, etc Furthermore the close relation of the transversalis fascia and the peritoneum in this region predisposes to oozing and difficulty in a clean approach.

I have found that a little modification in the sequence of steps in this operation makes it much smoother and more satis

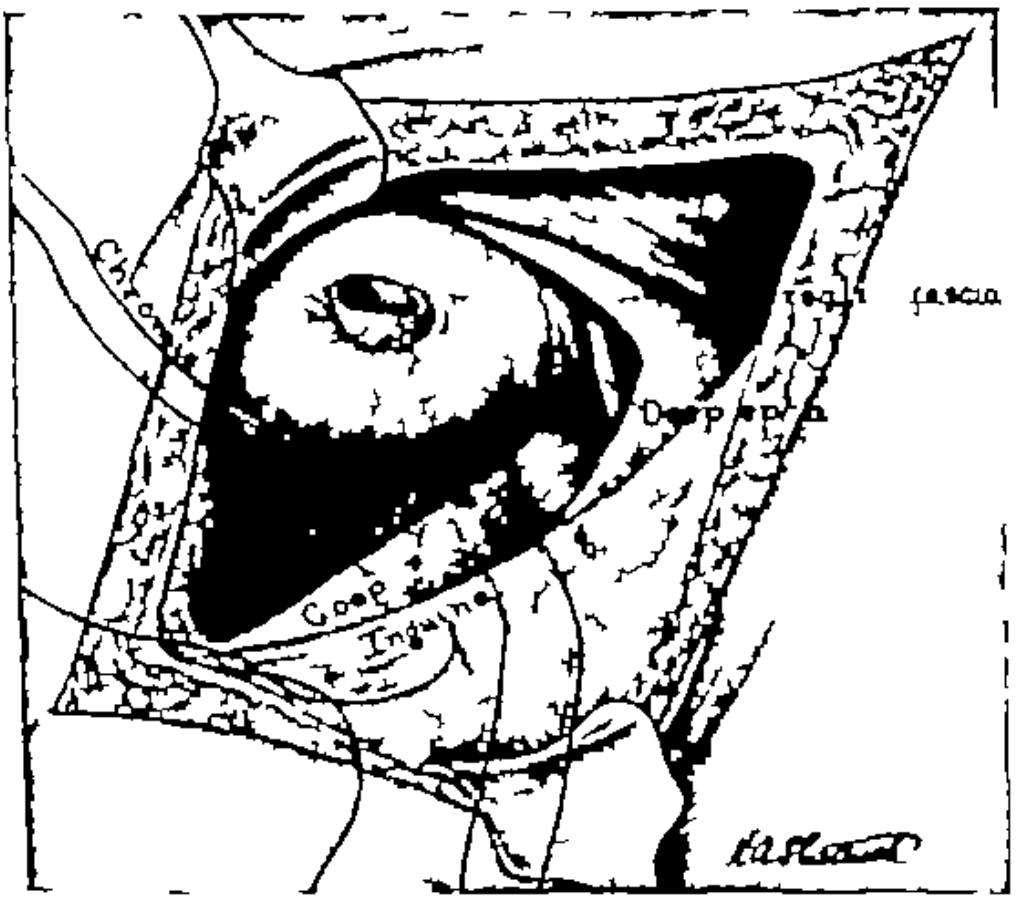


Fig 222.—Inguinal canal exposed from above Poupart ligament The transversalis fascia has been divided to show relation of peritoneum and retracted stump of hernial sac In practice, after splitting the fibers of the external oblique, exposure of Poupart and Cooper' ligaments is accomplished by simple mass retraction of all the structures in contact with them (After Seelig and Tuholske )

factory Instead of attempting to invert the sac from within and then being obliged to expose the sac directly in the end I have gone first below Poupart s ligament to deal with the hernial sac and then above Poupart' to close the opening in the canal The steps of the operation as in the case herewith illustrated are

This method of closing the canal has many advantages over that of a purse-string suture applied from below

(1) It is accomplished in plain view with good exposure instead of in the recess of the canal.

(2) Dependence is placed upon interrupted sutures instead of a single purse-string suture.

(3) No dimple is left at the entrance to the closed canal.

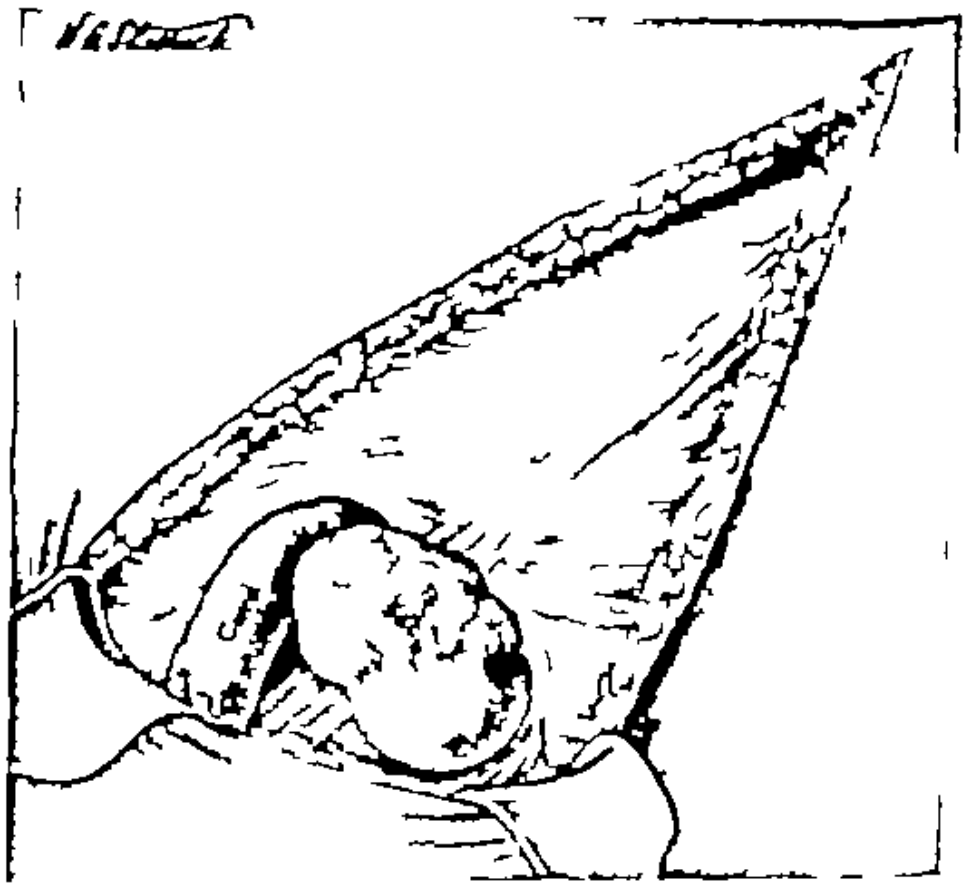

Fig. 221.—Lower edge of wound retracted expose hernial sac and femoral ring

(4) The inguinal canal is well reinforced, as closure of the wound is accomplished just as it is in operating primarily for inguinal hernia.

It is not always, however smoothly carried out, for the hernial sac may refuse to be inverted from within Several conditions common in femoral hernias may necessitate resort to direct exposure of the sac from below Poupart's—a small hernial

# INJURY AND TUMORS

With the constant increase of industrial accident surgery we have more and more frequently presented to us the problem of the relation of injury to the origin and also to the growth of tumors. Cancer and other malignant growths are an especially prolific source of dispute between injured employes and insurance carriers and on account of the seriousness of their outcome the amount of compensation involved is frequently large.

The problem divides itself into two definite and distinct phases (1) Does trauma cause the development of malignancy where none existed before? (2) Does injury increase the rate of growth of a tumor already present, or *increase its rate of metastasis?*

The first question—that of the part injury may play as a cause of tumor development—has been rather fully discussed from the industrial medicolegal aspect. Ophüls has recently summarized the situation Briefly it is rarely if ever possible to prove absolutely that the development of tumor after injury is not coincidence. Certain kinds of trauma, however—long repeated irritation, as of the tongue from ragged teeth or a single injury of some benign abnormality as a pigmented mole—have come to be generally regarded as definite factors in tumor development. *Commissions and other judicial* bodies have therefore tended to give the injured employe the benefit of any doubt. In order reasonably to place upon trauma the responsibility for the origin of a tumor however these points must be clearly established

(1) The fact of definite and reasonably severe injury at the site of tumor formation must be clearly proved.
(2) It must appear that no tumor existed before injury

Ophüls Calif. State Journal of Medicine, xix, 1921, 54.

(1) Incision parallel to Poupart s and almost immediately above it. The lower edge of this wound can be easily retracted to give excellent exposure of the sac, and it is an anatomically sound incision, which the incision across the groin is not. Painful contracture across the groin does not result.

(2) The sac is exposed and cleared from surrounding tissues, opened, and the contents dealt with as usual. This accomplished, the neck is drawn down through the canal, ligated high, cut, and the stump allowed to retract.

(3) The inguinal canal is exposed by splitting the fibers of the external oblique above Poupart's as in inguinal herniotomy and the internal oblique and contents of the canal held away from Poupart's by gentle retraction, while the edges of the hernial opening are approximated by interrupted sutures.

(4) The conjoined tendon and edge of the internal oblique are sutured to Poupart s ligament as in inguinal hernia operations the structures lying in the canal remaining undisturbed. Closure of the external oblique and of the skin completes the operation.

The advantages of this procedure are obvious

(1) Every step is performed in plain sight.

(2) No procedure is attempted which may have to be abandoned in favor of another thus diminishing trauma and conserving time.

(3) The peritoneum above Poupart s ligament is not opened and the danger of bladder injury is thus reduced

(4) At the same time the operation has all the advantages of the closure from above Poupart's—closure of the canal flush without leaving a dimple—use of interrupted sutures instead of a single purse-string reinforcement against subsequent inguinal hernia in the course of closure

extraordinarily rapid metastasis. And within the past few months Lella Knox, in a very beautiful piece of research, has corroborated and extended this observation, and has shown that the effect of gentle massage in producing wide-spread rapid metastasis is in direct relation to the grade of malignancy of the tumor

The following case demonstrates positively the effect of injury on the growth of tumor tissue E. L. fifty five. All his life has had a dime-sized smooth surfaced, elevated black mole on the plantar surface of his fourth toe. Seven months ago his first intimation of change was the appearance of small lumps (skin metastases) on the backs of the second and third toes and on the skin of the foot. Four months ago (*i e* three months after first appearance of metastases) he was struck by the edge of an oil drum in such a way as to bruise the metastasis on the dorsum of the second toe but none of the others Since this injury the bruised lump has grown with great rapidity until it has reached the size of an egg while the uninjured metastatic nodules have grown almost imperceptibly Thus case therefore presents an opportunity to compare accurately the growth of injured and uninjured tumor tissue (identical in character) in the same patient under conditions identical except for the injury (Microscopic examination of tissue in this case showed the tumor to be melano-epithelioma—the metastases non-pigmented)

Knox Annals of Surgery lxxv 1922, 129

(3) There must be a sufficient lapse of time between the injury and the appearance of the tumor and, on the other hand, the tumor must appear within a reasonable time limit after injury. Three weeks to three years are the limits usually set.

Case No. 2114 now at St. Luke's Hospital, illustrates the points mentioned. Mrs. E. A., forty-eight, married, history of five normal lactations. Eleven months ago a high oven door in a bakery fell against her, the handle of the door striking the upper outer quadrant of the right breast. The contusion was so severe as to demand medical attention, so that she was examined then and several times later by the physician to whom she was sent by the insurance company. The first two of the essential points noted were thus satisfied. The fact of injury is well established and it appears from the record of medical examination made immediately after injury that no tumor existed at that time. She now presents herself with a large cancer in this region of the right breast, already presenting one small skin metastasis. She has been aware of the lump at least two months, but the stage of the cancer makes it probable that *a lump has existed somewhat longer than she has known of it.* In other words, with no tumor previously existing she has developed a breast cancer at the site of a well-authenticated bruise within approximately six months or less.

The second phase of the problem—that of the effect of injury on the rate of growth of tumors or upon their rate of metastasis—has been less thoroughly discussed in the literature though much more susceptible of positive proof. It is the consensus of opinion among surgeons dealing with cancer and based on observation of many cases that tumors tend to grow more rapidly after injury and especially to metastasize more rapidly. Even such trauma as that of repeated examinations for diagnosis or rough handling during operation has been incriminated. Tyzzer[1] demonstrated several years ago that less than one minute of ordinary massage of breast cancer in mice will cause

[1] Wood, F. C. Jour. Amer. Med. Assoc. 73, 1919, 764.
Tyzzer. Jour. Med. Res. xxix, 1913, 309.

# CLINIC OF DR. SAXTON POPE

UNIVERSITY OF CALIFORNIA HOSPITAL

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## CHOLECYSTENTEROSTOMY

To the surgeon who goes into the abdomen with a fixed idea and with a determination to remove the gall-bladder it seems appropriate to sound a note of warning

With the recognition of the part played by chronic infection with or without stones in the gall bladder and the benefit of the operation of cholecystectomy we have overlooked other problems of the biliary tract. As for cholecystectomy surgeons seem to have abandoned all other maneuvers in this quadrant of the abdomen.

In all large clinics it is a common experience to see patients who have had their gall-bladders removed by some intrepid surgeon who has ignored the fact that the common bile-duct is permanently obstructed either by stricture, stone or tumor These victims of poor judgment, if they survive the assault, are the unhappy possessors of a chronic biliary fistula.

It is self-evident that the presence of stones high up in the hepatic ducts must necessarily result in a later descent and obstruction, even where the common duct has been cleaned. Concretions impacted at the ampulla are not always removable except by a transduodenal approach. Tumors at this site are much more common than we think

Malignant involvement, either of the duct or the pancreas prevents a form of bile stasis that must be relieved even though it may be only a palliative measure.

With the conception of the gall-bladder as a focus of infection and secondary lymphatic invasion of the pancreatic structure with the production of chronic interstitial pancreatitis we seem to forget that the ducts also are infected, drain into the

barium entering the anastomosis, but no clinical evidence existed suggesting that this was in any way detrimental during the process of digestion.

The method of making the anastomosis is simplicity itself The ducts are explored and if necessary drained. The gall bladder is emptied of stones and sutured at its fundus to the second portion of the duodenum with a running chromic suture. The bowel is incised for the distance of an inch and the two mucous edges are sutured with a second running chromic stitch. The closure is completed by continuing the first suture over the anterior surface of the anastomosis. There is little danger of infection from either visceral contents and no tendency for the union to come apart.

Even atrophied and apparently functionless gall-bladders have taken up the service of bile drainage through this round about way Secondary exploration in 2 cases of this series has shown that thickened and damaged gall bladders seem to improve in texture with this drainage. In fact, it is suggested by our experience that any gall-bladder demanding drainage except of acute suppuration, preferably should be emptied into the intestine instead of the outer world.

The moral of this story then is that we should attack a surgical problem of the hepatic quadrant with an open mind We should attempt to ascertain the exact pathology of the biliary system and adjust our surgical maneuver to meet the issue. There are indications still for simple drainage. There are situations best met with cholecystectomy

Lesions in the ducts present some of the most difficult problems of abdominal surgery and require the best technical judgment and skill to solve Cholecystenterostomy offers a way out of many otherwise impossible situations. We advocate it as a measure warranting more popularity than it does at present

And last but not least we suggest that in the absence of demonstrable pathology of any of the structures of the hepatic system it is not a discreditable thing to leave the patient in possession of his gall-bladder and close the wound.

same lymph-channels and contribute to the pathology Removal of the gall-bladder will not necessarily relieve the condition. Therefore it is proper to lay emphasis upon the procedure of cholecystenterostomy In this measure we utilize the gall-bladder as a vehicle of drainage. The outflow may be either through the stomach or the duodenum. The colon, though handy in location, is unsuited to our purpose Here we have a method of obviating what otherwise must be a fatal episode in the life of the patient.

Cholecystenterostomy stands in the same relation to gall bladder surgery that gastro-enterostomy does to stomach surgery It is a subterfuge, an evil necessity but a life-saving operation. The indications for its use are Stones in the common or hepatic ducts that cannot be removed or where the surgeon is not certain of the absence of more than he sees tumor or stricture at the ampulla where it is not curable by a transduodenal operation malignancy of the pancreas or stomach producing obstructive phenomena Injury to the ducts incapable of surgical repair

In the past ten years at the University Hospital and in my own private work this operation has been resorted to 16 times. The indications for operation were as follows

| | Cases |
|---|---|
| Malignancy with obstruction | 6 |
| Inoperable or impacted stones | 4 |
| Tumors of the ampulla | 2 |
| Pancreatitis | 2 |
| Chronic infection of tract | 1 |
| Acute suppurative pylephlebitis with obstruction | 1 |

There were 3 postoperative deaths in this list, 2 in the malignant list and the pylephlebitis case

That done for alleged chronic infection was later followed by cholecystectomy because of its failure to benefit the patient All the rest were eminently satisfactory for the purpose for which they were done In good surgical risks the procedure is unattended by any particular danger

Radiographic studies were made postoperatively in 2 cases of cholecystoduodenostomy They showed small amount of

## CLINIC OF DR. LEO ELOESSER

### San Francisco Hospital

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## LEG ULCER

The poor always we have with us likewise leg ulcers for poverty and leg ulcer go together They keep our municipal hospitals and charity institutions filled. They deserve more than the grudging and uninterested services ordinarily given them, for aside from a certain interest attached to the ulcers

Fig 223.—Arteriosclerotic ulcer

themselves and their care the sufferers uniformly have infirmities other than their ulcerated legs.

Hospital records and card catalogs *file* all leg ulcers indiscriminately as "varicose ulcer Varicose ulcers however by no means make up the full list of leg ulcers.

last time on April 4 1921 He had been in hospital twice before in 1918 for four months and again a year later Besides the large ulcers shown in the photograph (Figs. 223–225) he showed incipient cataracts a senile arc in both corneæ and sluggish pupils. His gums and teeth were foul and his tonsils inflamed. His urine contained albumin and hyaline casts his

Fig 226.—Left leg, periostitis of tibia and fibula

phenolsulphonephthalein output was 12 per cent. for the first hou and 5 per cent. for the second. The record of his blood pressure is missing A pulse was palpable in the left posterior tibial artery but not in the right one *neither dorsalis pedis* could be felt t pulsate Radiograms of the legs showed a periostitis of the left tibia and fibula, with great osteophytic

Fig. 224.—Arteriosclerotic ulcer

Fig. 225.—Arteriosclerotic ulcer

H. E. is a case in point. He was a carpet layer sixty-five years of age who entered the San Francisco Hospital for the

the leg Following the injection of barium-gelatin the arteries were injected with methylene-blue The posterior tibial was stained blue the anterior tibial was not penetrated by the stain.

Fig 228.—Radiogram of amputated leg with injected arteries anteroposterior view

The radiograms show that the posterior tibial and peroneal arteries have filled with barium, but that none has penetrated the anterior tibial The lumen of the arteries is very thin and has filled irregularly There is a meshwork of fine vessels espe-

masses penetrating through the interosseous ligament. There were no chalky deposits to be seen in the vessels (Fig. 226).

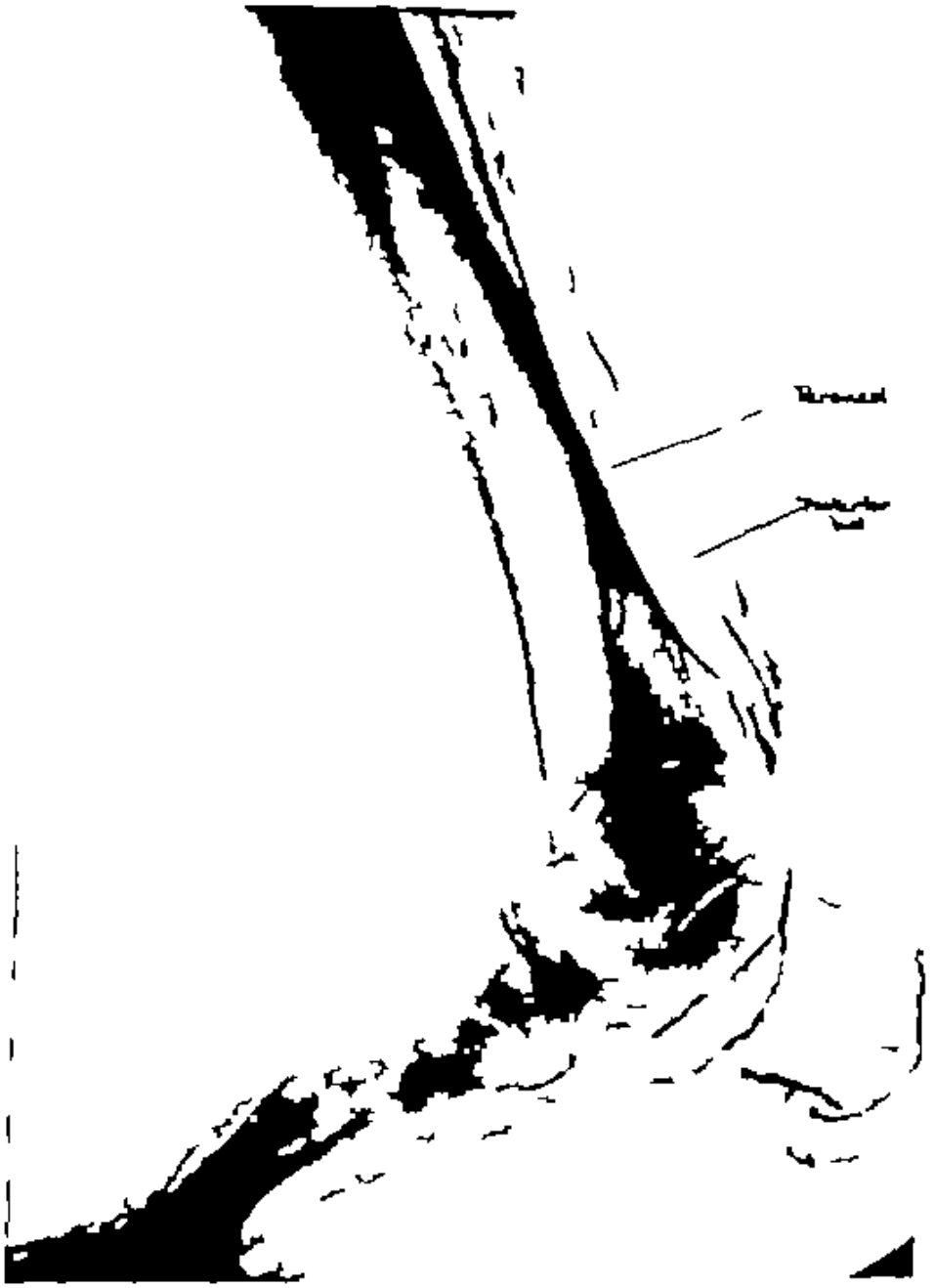

Fig. 227.—Radiogram of amputated leg. Injected arteries lateral view.

On April 19, 1921 the right leg was amputated below the knee. *Immediately after amputation* the vessels were injected with barium-gelatin mixture and a radiogram was made of

estimated whether this was the primary factor underlying both the arteriosclerosis and the ulceration or whether it was merely secondary remains uncertain

A second patient, A. J a bookmaker of fifty-seven years, shows an entirely different type of ulcer—a much more painful and an equally stubborn, although a less dangerous type. Like H. E., he also had been admitted to hospital several times. He had had a soft chancre twenty-nine years ago and gonorrhea half a dozen times as a young man. Six years ago he had a varicotomy done on the left leg Three unsuccessful attempts were made to heal the ulcer with skin-grafts. The man was a

Fig 230 —Trophic ulcer

heavy drinker and a constant cigarette smoker Eight years ago both legs became edematous and a small sore appeared over each internal malleolus. The left one persisted until three years ago when it was healed at this hospital and remained so under the use of zinc-gelatin bandages. The right one had been open for eight years For the last six years the man had suffered from intermittent claudication. He could walk about a block, when cramps in the calves forced him to stop and rest. After resting a few minutes the cramp would cease and he could go on for another block The patient looked about ten years older than his *tated age* Both corneæ had a senile arc. The pupils were small His teeth were foul and the gums inflamed.

cially marked in the substance of the calf muscle and in the foot, which is well injected (Figs. 227 228) The main body of the blood-stream has therefore sought by paths through the smaller vessels. The dorsalis pedis is missing on the proximal part of the foot, but reappears on the distal part from the base of the metatarsals onward. One can see small anastomoses winding their way through the sole from the thin plantar arteries to this small vessel on the dorsum of the foot. Radiograms of a cross-section of the leg through the lower third (Fig 229) show

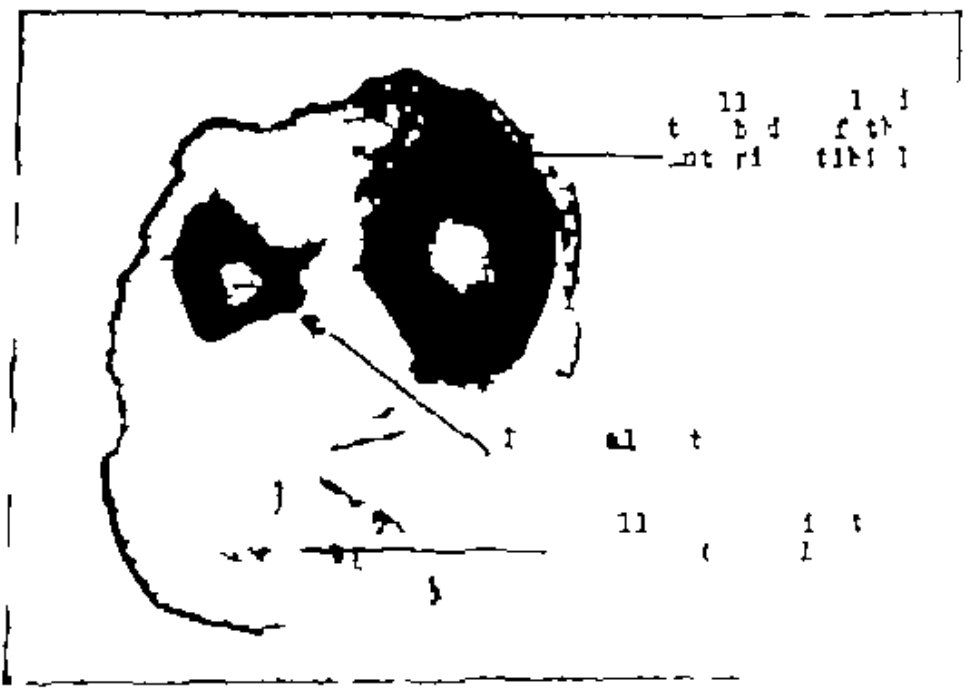

Fig 227.—Radiogram of amputated leg with injected arteries view of cross-section at lower third of leg.

fairly plentiful small vessels in two places corresponding to the body of the calf muscl and to the anterior tibial. The peroneal artery is visible a few small dots mark the sit of the anterior tibial the posterior tibial does not ppear ha ing been dissected out of the specimen

The cause of H. E.s deep ulcers lay in his arteries rather than in his varicosities. His was not aricose ulcer but an ischemic one the result of localized patch of arteriosclerotic gangrene The rôle of his accompa ying periostitis cannot be

charged with a zinc-gelatin bandage on the 'practically" healed leg. After his discharge it healed entirely but broke down again, so that our man was readmitted ten months later and spent another month in hospital

These are but two samples chosen from a long list They suffice to show what interesting matter may lie buried beneath an old leg ulcer

Among the commoner causes of leg ulcer one may count *varicosities* and their sequels (thrombophlebitis and perforation) deficiencies of the *arterial blood supply* arteriosclerosis, and the diffuse fibrosis that is the result of a chonic undernourishment of the tissues *infections* whether of the skin itself (eczema and

Fig. 232 —Arteriosclerotic ulcer

other dermatitides) or f the deeper parts, periostitis and osteomyelitis and finally less clearly understood causes—the so-called *trophic* ones.

Each of these types of ulceration—the varicose the arteriosclerotic the infectious—are fairly well distinguishable although often enough two or even all three of them may be combined in a single ulcer

True varicose ulcers are usually small, rarely as large as a dime lie directly over small venule whose purplish course may be traced above and below them and are covered with a black scab Other ulcers especially the infectious ones, may be accompanied by varicosities aggravating the infectious elements of ulceration Thrombophlebitic ulcers may be large several

There was a network of small dilated bluish venules in the skin of both legs the anterior medial side of both legs just above the ankles was coppery brown (*Fig 230*) Over the right internal malleolus was an ulcer about 1 cm. across, with a hard callous edge and a fibrous base The ulcer was extremely tender the patient complained of a burning pain in it day and night, and cried out loudly when the ulcer was touched. Radiograms showed a few minute chalky spots in the vessels below the knee.

Fig 231.—Thrombophlebitic ulcer

There was no pulse to be felt in either popliteal or in either posterior tibial, nor in either dorsalis pedis artery The femoral arteries pulsated well on both sides The blood-pressure varied from 126/70 to 136/72 at different times. The phenolsulphonephthalein output was 15 per cent the first hour and 30 per cent. the second. The Wassermann reaction (twice repeated) was negative The urine contained neither albumin nor casts. The eye-grounds showed arteriosclerotic changes. A pinch-graft was placed on the ulcer and in thirty-one days the patient was dis-

when the ulcer is touched. The ulcers are usually quite small not more than ½ to 1 cm. across, round sometimes fairly deep sometimes superficial sometimes punched out, sometimes flat their edges are dusky blue or brown their base is covered by dusky sluggish granulations. The ulcers almost always lie at the internal malleolus at the endings of the long saphenous nerve rarely one meets a painful ulcer at the external malleolus.

Not uncommonly one finds combinations of all three of the ordinary causes of ulcer—varicosities, arteriosclerosis, and infection—especially in the long-standing ones. Most frequent is the combination of varicosities and infection, either as an infective thrombophlebitis or as the result of trauma. Infection with superimposed local arteriosclerosis and other arterial changes one finds in the chronic ulcerations that follow old infected fractures and old osteomyelitides.

Arteriosclerotic ulcers and many infectious ones commonly have sharply punched-out, round, or scalloped edges the edges which text-books say are diagnostic of lues. But neither the infectious nor the arteriosclerotic type of ulcer is luetic at least not gummatous. Lues may be an underlying factor in so far as the underlying arteritis or periostitis may be luetic, but the ulcers themselves are not luetic nor will they yield to antisyphilitic treatment True gummas of the legs are rare in comparison to the frequency of ordinary leg ulcers. Among 76 leg ulcers at the San Francisco Hospital a positive Wassermann occurred but 11 times.

True varicose ulcers—i. e. those caused by a thrombosed and ulcerated or an ulcerated and bleeding venule alone—are fairly uncommon varicosities usually ulcerate after some complicating infection. Thus we see varices at the anus—hemorrhoids—more frequently even than varices of the legs, yet an ulcer at all comparable to a leg ulcer never occurs at the anus. Only thrombotic ulcers and ulcers from perforation (the ulcers of thrombosed or bleeding piles) ulcers caused by varicosities plus infection complicate hemorrhoids. Callous ulcers comparable to the ordinary ulcer of the leg do not occur at the anus. Rather then, than label all leg ulcers as "varicose ulcers it

inches across usually have hard callous edges and a base cov ered with torpid dingy granulations, products of a slowly organizing blood-clot.

Infectious ulcers may be due to progression of a superficial skin infection into the deeper parts and may follow a small scratch or abrasion, or they may arise from a deeper infectious process, an old osteomyelitis, or a periostitis which invades the skin from underneath. Infectious ulcers arising from eczema or other superficial processes usually lack a sharply defined edge and heal rapidly if they are not complicated by disturbances in the blood-supply of the legs. They may penetrate deeply but when they do t is quite characteristic that scattered about in the large ulceration there remain islands of epidermis. If one looks carefully one will see standing out in the granulating floor tiny white pearl-like knobs of skin which have escaped destruc tion little islands of skin which the surgeon will hail with delight. They will spread out grow larger and larger from them as a center there will sprout islands of epithelium which will gradually flow together and fuse with each other and unite with the epithelium growing inward from the edge of the sore

Arteriosclerotic ulcers are usually large If they are the products of an acut occlusion of an artery they are covered by a black or greenish slough penetrating very deeply and leaving after it demarcates the tendons or the periosteum exposed They usually have perfectly well-defined punched-out or scalloped edges. If they are the products of a gradual fibrosis and under nutrition the slough is absent, but the ulcer may be very large It also has a sharply defined scalloped edge and a fibrous base covered with small granulations.

Besides these three types there is form of ulcer that seems to have a less tangible cause a cause having t do perhaps with the nerve supply These trophic ulcers if one so wants to call them (Bell described them in 1784 a irritable ulcers") immediately distinguish themsel es from other leg ulcers by their exquisite tenderness. Most leg ulcers re of course painless. Patients with irritable ulcers however not only complain of a constant burning pain but cry out outrageously

varicose, and 37 infectious. Some of these had a mixed etiology. Forty nine of the patients were over fifty years of age 27 were under fifty. Of the 25 arteriosclerotic ulcers, however only 3 occurred in patients under fifty. The 76 patients spent 2831 days in hospital the arteriosclerotic ulcers averaged 64.2 days per patient the varicose and infectious ones 27 days, or less than half the time. Twenty-nine patients were discharged with their ulcers completely healed 23 with the ulcers improved but still open, making 52 or about two-thirds of the number cured and improved. Twelve were unimproved, most of them remaining only a few days. 3 died. In 9 the state of the ulcer on discharge is not noted. The blood-pressure readings appear on 12 of the charts of the arteriosclerotic and on 13 of those of the varicose ulcers. Of the 12 arteriosclerotic ulcers, 6 showed systolic pressures of over 170 mm. Of the 13 varicose ones but 1 had a pressure over 170 mm.

The urine was examined in 67 of the patients. 19 or about one-quarter of the whole, passed albumin. Of 24 arteriosclerotic ulcers 13 or more than one-half suffered from albuminuria. The Wassermann test was done in 64 patients it was positive in 11 about one-sixth of the whole of 15 Wassermann tests in the arteriosclerotic group 3 or about one fifth, were positive. A history of typhoid is noted in 7 patients milk leg in 4.

The treatment of leg ulcer resolves itself into three problems—to clean the ulcer to heal it and to keep it healed.

Varicose ulcers are easy to clean so are the superficial infectious ones those without a deep suppuration such as an osteomyelitic sinus to keep up the infection. Arteriosclerotic ulcers ulcers with an old scarry fibrous bed are very slow to clean. They become reinfected easily often the ulceration spreads under the eyes of the surgeon instead of diminishing. Mild lotions—solutions of boric acid, of aluminum acetate of lead acetate—are more useful than strong antiseptics in covering the floor of the ulcer with healthy pink granulations. Compressing the ulcer with a solution of picric acid for one day or touching it with a silver nitrate stick will sometimes convert a poorly granulating ulcer into a healthy one. Dakin's solution

seems more logical to seek for some anatomic peculiarity of the legs which might account both for the frequency of varicosities and of ulceration in this part of the body

Three peculiarities of the legs are striking The first is that the blood stagnates in the veins of the leg more readily than in other parts of the body this stasis is helped by our upright posture and by the fact that most people use the muscles of their legs much less actively than they do other muscles those of the arm or the back for instance. Most of us stand or sit a great deal more than we walk or run most of us, for every one step we take change the position of our arms or our body dozens of times, whether we are sedentary workers or whether we work standing on our feet.

The second peculiarity of the legs and ankles is that nowhere else in the body do we find so large a mass of living substance with so poor an arterial blood-supply and so little need of one. A cross-section of the ankle and the lower third of the leg shows a negligible amount of muscle It consists almost entirely of skin, tendons fascia and bone all f them poorly nourished passive tissues.

The third peculiarity of the legs is that they are much exposed to infection both internal and external. Their lymph-vessels and the lymph-vessels f the pelvis and of the anus debouch nt the same cess-pool

It is in a combination of these three factors—blood stasis, arterial anemia exposure to infection—that the susceptibility of the legs to ulceration must be sought One or the ther of them will explain the commoner kinds of leg ulcers—the art riosclerotic, the infectious, the varicose.

In 1920 there were listed in the San Francisco Hospital 76 patients with leg ulcers. This number is too low good many patients entering hospital for other causes, but suffering from leg ulcers as minor complaint, do not appear in the indexes of the 76, 46 were men and 27 women. The incidence is bout equally distributed between the sexes the ratio of male to female patients admitted t the surgical wards being about 2 to 1 Of the 76 25 may be classified as of arterial origin, 40

after months in bed, one may occasionally succeed in covering them over but the cure is not worth the effort. The ulcer will break out anew on the slightest injury often as soon as the patient gets out of bed. Such neglected ulcerous legs should be amputated.

Only after the ulcer is *completely* healed should the man be allowed out of bed. It is no saving in time to discharge a man with a 'practically' healed ulcer The 'practically' healed ulcer usually grows larger after the man leaves hospital in a few months he is back with a leg worse than ever before.

When the ulcer is *completely* healed the leg should be kept bandaged. Zinc-gelatin is good if the man can be watched from time to time. If however he is careless in reporting or if he is to travel away from competent medical care, it is better to teach him to wrap his leg firmly from the foot to the knee with a flannel bandage (a soft spiral puttee is good) or a woven cotton elastic bandage. Either is better and cheaper than a rubber elastic stocking

When zinc-gelatin is used the man should be ordered insistently to report for a change of bandage as soon as the gelatin gets hard at least every four weeks or immediately he sees the first signs of ulceration going on under the bandage a spot of serum or pus coming through. If the men are discharged without proper instructions they will often come back after weeks and months with a hard foul bandage, chafing the leg into a new ulceration and caked with pus.

The zinc-gelatin is made of zinc oxid and gelatin, 1 part of each water and glycerin, 2 parts of each The gelatin is dissolved in hot water the zinc oxid added and then the glycerin. The mixture is kept in a tin o agateware vessel not in a jar It is melted by placing the tin in a water-bath. Several loosely rolled coarse mesh crinolin bandages, 5 yards long by 3 inches wide are dropped into the melted gelatin and allowed to soak thoroughly The bandage is then applied perfectly smoothly and evenly without creases and without reverses beginning with a turn about the foot below the ankle. Each turn is wrapped once around the leg and then cut off Each succeeding turn

is risky the burns of Dakin's solution will cause new ulcers, that may be more difficult to heal than the original ones. Stronger antiseptics, iodin and alcoholic solutions, do harm. Ointments are useful in ambulatory patients, silver nitrate 1 per cent. balsam of Peru 10 per cent. in a vaselin-lanolin base. Scarlet red ointment is distinctly harmful. When it is used the granulations become covered with a dingy grayish fibrinous exudate.

Hospital patients should be put to bed and kept there until their ulcers are closed. If they are well enough to be up they are well enough to be discharged. The ambulatory treatment of ulcer has its advantages, but ulcers certainly heal more rapidly when the patient is kept in bed with his legs elevated.

Once ulcers are clean, the question comes of healing them over. Small ulcers will heal under the old Baynton dressing: small strips of sterile adhesive plaster applied directly over the ulcer and left unchanged for five to seven days. Larger ones must be closed with grafts. Reverdin grafts ("punch"-grafts) give a thicker, more resistant covering than Thiersch grafts. A small cone of skin is lifted up on the point of a needle and the base of the cone is snipped off with a pair of scissors. A series of these islands of skin placed about ½ inch apart is laid directly on the granulations and covered with rubber tissue. Reverdin *grafts will live when Thiersch grafts will not. They may* be placed on fibrous ulcers where Thiersch grafts will not stick.

Large ulcers, when covered by healthy pink granulations, especially recent ulcers, the result of operative wounds or injuries, may be covered by Thiersch grafts.

After the grafts have taken (about a week after operation) they may be painted with a weak solution, 1 or 1½ per cent. of scarlet red in olive oil. This will cause them to thicken. Only the grafted skin and not the granulations should be painted with scarlet red.

Large arteriosclerotic ulcers, when the whole thickness of the leg is hard and *fibrous, especially the ulcers that one sees ex*tending circularly around brawny edematous and elephantiasic legs, cannot be healed. By dint of great care and patience and

## CLINIC OF DR FRANK W LYNCH

### University of California Hospital

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# ETIOLOGY AND TREATMENT OF PROLAPSE

Much of our knowledge of prolapse is of very recent origin This is due chiefly to two reasons First, surgeons almost without exception have reported their series only as cases of prolapse and have made no effort at proper classification, in spite of the fact that all have long since known that there are many different types of prolapse which have varying probabilities of cure. Second, there has never been an agreement as to the time which should elapse before a case could be counted as a cure It seems perfectly reasonable to assume that the operative result of many advanced cases has never been properly tested from the standpoint of recurrence The older patients often escape recurrence only because the infirmities of their age restrict their muscular activities and thus inhibit excessive intra-abdominal pressure. Consequently they may die before the operation has had a fair test. All reported results, therefore present many chances of error being influenced more profoundly by the percentage of complete prolapse of the entire floor and the number of extreme cases in young women in the series than upon the type of operative procedures employed. Until proper classification is universally recognised there is very little to be learned from the case reports of the literature.

It is the object of this paper to call attention to a classification which will be most helpful to the surgeon, and to briefly consider certain fundamental principles that we have developed for the cure of complete procidentia from a follow-up study of 52 cases of complete prolapse that were treated by one method

The classification to which I would call your attention was developed by Dickinson from study of the plates of the truly

overlaps its predecessor by half its width, so that the finished bandage consists of two layers, no more The bandage is patted with a handful of absorbent cotton and dusted with talcum so that it may not stick to the underclothing

Occasionally it may be necessary to put the bandage over an ulcer which is not quite healed. In this case the ulcer should be covered with a little dab of cotton soaked in zinc-gelatin before the bandage is applied the finished bandage should be opened by a crucial incision over the cotton. The ulcer is dressed through this little window the flaps of bandage are pasted down with a turn of adhesive plaster after each dressing

Varicotomy rarely leads to a cure of ulcer The large tortuosities of the dilated saphenous vein which are curable by operation do not cause ulcer it is the small purple teleangiectatic venules located in the skin itself that thrombose and ulcerate or perforate their very thin covering and bleed and these venules are irremovable

"Trophic" ulcers, especially those over the internal malleolus, may be helped, it is said, by resection of the saphenous nerve. The resection should be done at some distance from the ulcer itself

*Occasionally recurrent ulcer may be excised* and the resulting defect covered by a plastic of the whole thickness of skin not, of course the ulcers of the aged and decrepid but extensive ulcers following burns and crushing injuries in otherwise healthy *young individuals. A long tube flap may be swung down* over the ulcer from either the same or the opposit thigh.

The treatment f ulcers is tedious it needs care and ingenuity and patience to effect cure

*Review your cases of leg ulcer* ge themen you will find among them many examples of interesting disease of the arteries, the veins and the nerves there will present themselves t you many unsolved problems concerning the peripheral circulation. *its distribution, and its physiology* you will unearth ma v a quaint history of vagabondage and you will occasionally help to cure

The perineal segment includes all the perineal pyramid and that part of the rectovaginal septum behind the posterior vaginal wall. It is supported by levator fibers.

The retro-anal segment lies posterior to the middle of the gut and is supported by the levator and pubococcygeus muscles.

There are other cleavage planes better known on the sides of the pelvis. They run from the steep slopes of the levator and in the cross span of the triangular ligament. They are well known to all operators.

Dickinson's remarkable paper has done much to elucidate many of the confusing points of the prolapse problem. He emphasizes many things among which we will quote

1 A prolapse may occur in the presence of well-developed levators due to their diastasis.

2. While any combination of the four segments may be displaced downward prolapse of the second or vaginovesicouterine segment, is the most common.

3 Prolapse of the second segment was associated with a cleavage in the postpubic region in 15 of 33 of Halban Tandler's series, complicating the problem by removing a firm anterior anchorage so necessary to effect a cure since the firmest perineal segment will *not suffice to support this section of the floor*

4 The perineal segment is displaced more often than any other dislocation of lesser degree, due doubtless to the trauma of labor and the constant straining of the weakened fibers during defecation.

5 The retro-anal segment is least commonly displaced. Even complete *extrusion* of bladder and uterus *may exist without it.* Fortunately so since it can occur only when there is hopeless atrophy of the levators and fascia when cure may not be possible unless the plastic may include the gluteus maximus muscle

Prolapse of the first or second degree is frequently met with It constitutes its own problem chief of which is the fact that it often occurs in young women whose activity *makes it difficult* to cure It assumes especial interest when we recall that complete prolapse which shares with cancer the odium of being the most difficult gynecologic conditions to cure was at one time a simple

remarkable anatomic preparation of prolapse described by Halban and Tandler It is in reality a study of cleavage lines since Dickinson finds the following transverse cleavage planes illustrated in the Halben-Tandler series (Fig 233)

1 Postpubic, close to the bone.
2. In the urethrovaginal septum close behind the urethra.
3 In the rectovaginal septum just behind the vagina.
4 Along the anorectal canal

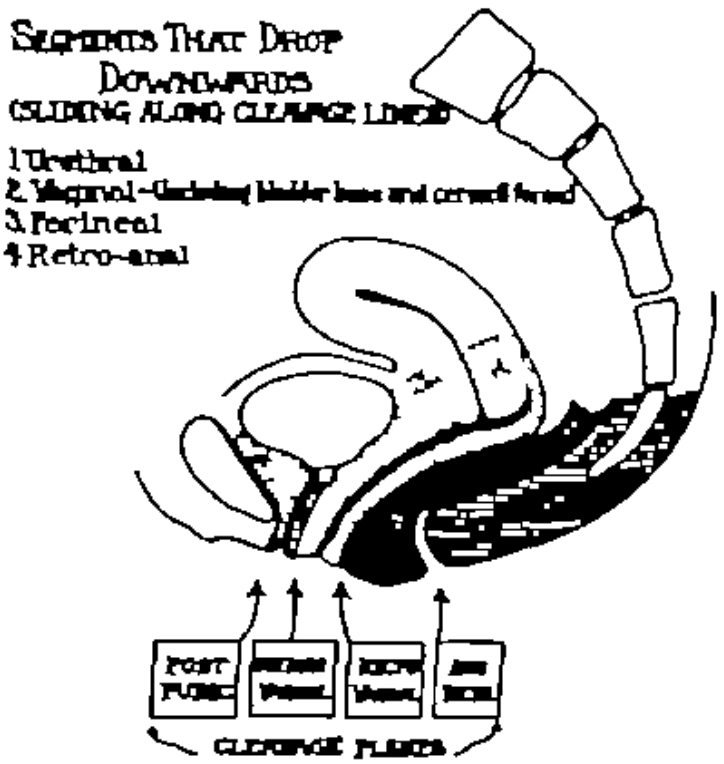


Fig 233 —Cleavage planes. (After Dickinson.)

There are in consequence four segments—urethral, vaginal, perineal and retro-anal

The urethral segment includes the whole urethra, the anterior or postpubic bladder and the postpubic triangle The triangular and pubovesical ligaments form its supports.

The vaginal segment includes the vagina and most of the urethrovaginal septum and the bladder base as well as the cervix and the posterior vaginal wall. It is attached laterally to the base of the broad ligaments, and behind to the uterosacral ligaments. It receives no levator fibers.

The perineal segment includes all the perineal pyramid and that part of the rectovaginal septum behind the posterior vaginal wall. It is supported by levator fibers.

The retro-anal segment lies posterior to the middle of the gut and is supported by the levator and pubococcygeus muscles.

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prolapse of the first or second degree Fortunately these simpler cases may be cured by one of a number of repair operations which are not destructive in character and which seem trivial when compared with those necessary to cure procidentia We will not consider them in this paper

Complete prolapse is a hernia of the pelvic floor It depends primarily upon injuries in childbirth and especially upon injuries to the upper pelvic floor which permit a sliding of the segments. The supporting structures of the upper pelvic floor center about

Fig 234 —Beginning cystocele The bladder insertion on the uterus sliding down. Teadler and Hallan prolapse

the cervix just as the muscles and fascias of the lower plane meet in the central tendon of the perineum. Given lacerations of the fascia about the cervix and prolapse will occur if the intra abdominal tension is kept at high level by hard work, especially when maintained during the atrophy of the floor during the menopause. Faulty forceps delivery accounts for many of the severe injuries Nothing can traumatize more than attempts at forceps extraction through a incompletely dilated cervix Prolonged second stages with a head on the perineum for hours, in

effort to deliver without laceration, account for their share But the common obstetric error is not as apparent Yet nothing save forceps applied through a half-dilated cervix can exceed the damage caused by straining for a long time against a floor blocked by a full rectum or bladder Few things are more incompressible than water

The character of the hernia is determined largely by the site of the chief rupture of the fascia. If it was on the anterior side of the cervix the continued thrust of intra-abdominal pressure gradually carries down that portion of the cervix which hyper

Fig 235 —Anatomy of cystocele The bladder has loosened from its attachment to the cervix Taxdler and Hallian prolapse.

trophies as it goes. With it comes a part of the bladder which may also loose some of its attachments from the cervical wall (Figs. 234 235) The resulting cystocele may grow occasionally by stretching f the bladder walls. If the chief injury is posterior to the cervix, the resulting condition may well be a hernia of the pouch f Douglas (Fig 236) Other segments may join in the displacement

The final result in either case is a complete inversion of the vagina a process which follows the stretching of the broad ligaments nd their continuation in the uterosacrals because of

their weakened base. Yet no example of procidentia is seen in operating rooms which does not have either the cystocele or rectocele as its chief feature. The cervix is markedly hypertrophied in all cases, pulled out by the diverging traction of the fascial supports of the pelvis which center about its sides. The uterine body takes no active part in the process. It merely follows the hernia in company with the other structures above the floor

Various operative procedures have been developed for the cure of procidentia and nearly all have been tried and found

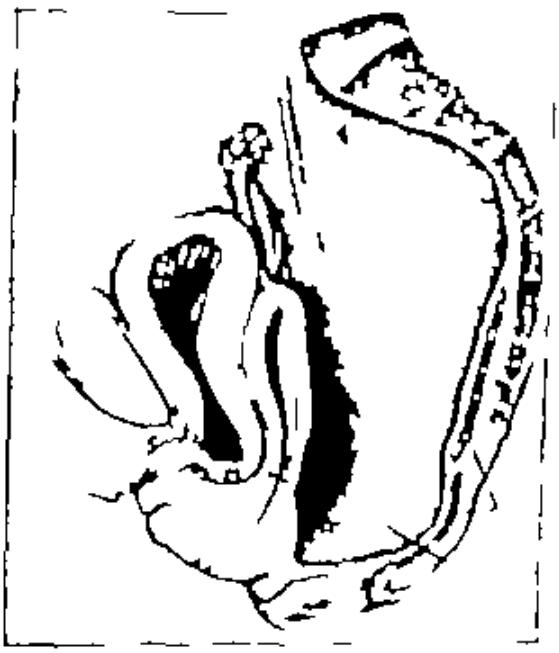

Fig 236.—Prolapse with giant rectocele. Tandler and Halban prolapse.

wanting. A most popular operation is described in many texts as a modified ventrofixation in which it would appear as if the fundamental feature of the procedure is the fixation of the cervical stump to the abdominal wall after a supravaginal hysterectomy. For this reason the operation is nearly always unsuccessful if the patient is active and does physical work unless most careful attention has previously been given to making firm pelvic floor. Following the fixation and the more usual type of repair the cervix is left to bear the brunt of the support of the floor. It cannot do so however unless the fascial sup-

tures have been corrected In which event the abdominal work is unnecessary and adds to the mortality The operation usually gives at least temporary relief because the new elevated position of the cervix protects in some measure the vesico-uterine plica from the great downward strain exerted from above This

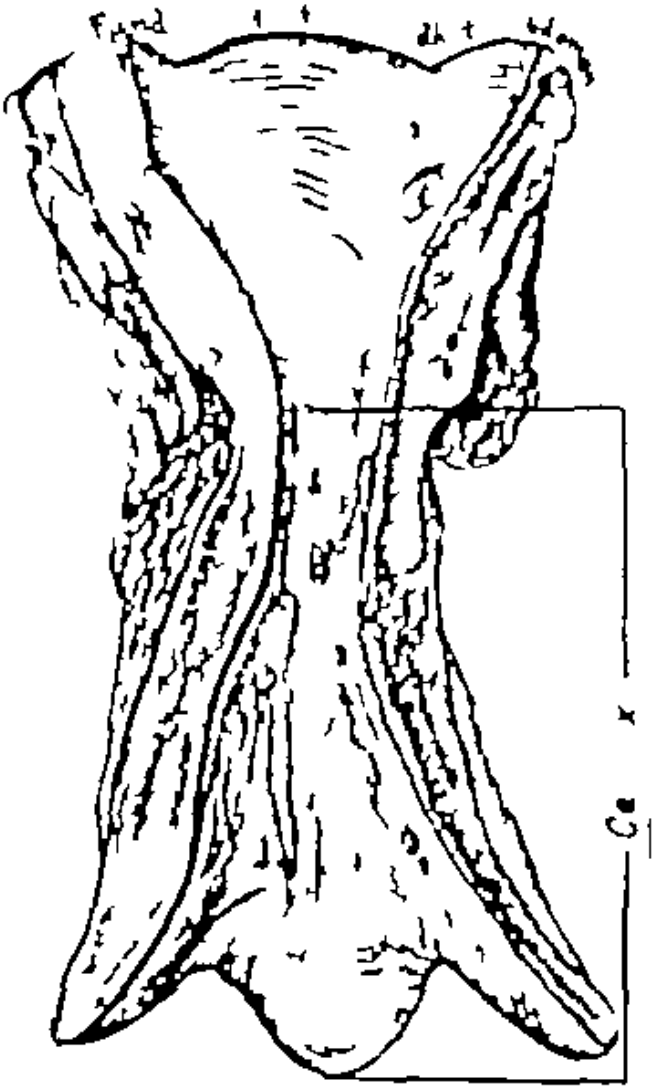

Fig. 237 —Enormous hypertrophy of cervix following eversion of uterus.

point is clear when we recall that cystoceles are usually the predominant features of procidentia. In case the fascial injury was in the region of the pouch of Douglas, the operation gives no fundamental relief With the return of the prolapse which is almost certain if the patient endures prolonged muscular strain

the cervix may hypertrophy to enormous length. In one of our cases the cervix was 5 inches in length (*Fig 237*) This specimen was removed from a heavy-set, active woman of seventy two who presented a complete prolapse (*chiefly second and third* segments) eighteen months following a ventrofixation, a cervical amputation, and a cystocele and rectocele repair done by a surgeon well known as a competent technician (Fig 238)

It follows logically that the operative cure of procidentia depends upon a proper reconstruction of the pelvic floor To this end in prolapse chiefly of the second and third segments

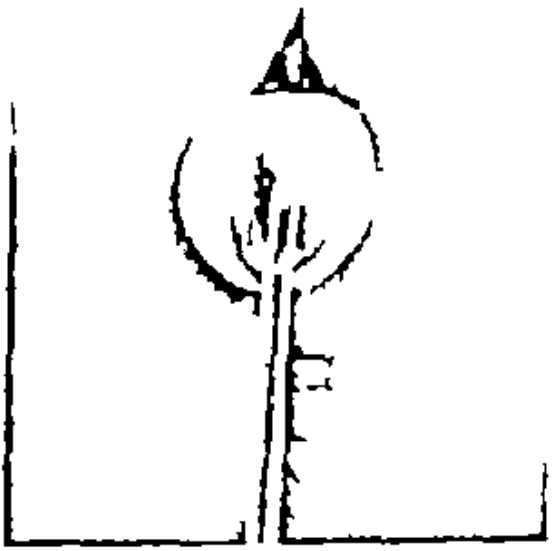

Fig 238—Complet prolapse following ventrofixation

1 The *upper angle of the* vagina is joined firmly t the shortened broad and uterosacral ligaments.

2 The orifice is held close under the pubic arch

3 The bladder is elevated upon the round and broad liga ments and supported by a remodeled pubicocervical f scial wall If there is prolapse of the first segment the upper pubic region of the bladder must be fixed in the bdominal all

4 The rectal hernia l closed by shortening and uniting the uterosacrals and continuing the closure by a fascial nd muscular union beneath the *remodeled posterior* vaginal wall

It is extremely essential that the vagina be narrowed as much as can be done in the individual case as a safeguard against recurrence While the removal of the uterus is probably not absolutely necessary we have been led to do vaginal hysterectomy to better shorten the supports and to permit the removal of the redundant tissue and to facilitate exposure. If vaginal hysterectomy is not done the cervix must be removed which amounts in old women to practically the same thing

Complete prolapse hardly ever occurs in young women and rarely prior to the menopause For this reason the removal of the uterus occasions little regret. It insures moreover freedom from uterine cancer in addition to points enumerated before. The removal of the tubes and ovaries adds to the success of the operation, since it makes available the upper broad ligament to help in elevating the vagina. We remove them therefore as a routine except in young women.

Complete prolapse appears common in San Francisco probably because of the stimulating climate which induces exercise as well as the many hills, which increases abdominal strain. In the following table is given our experience with procidentia during the years 1917 to 1921 All the cases in this series were treated in my clinic by the same procedure Figure 239 shows some of the cases. Without exception they were prolapse chiefly of the second and third segments. A few only had weakened support under the pubis and prolapse of the urethra There were no retro-anal prolapses

Given a good support of the urethra and posterior rectal wall our problem is to hold up the center of the pelvic floor The uterus is removed by vaginal hysterectomy since this permits a rational choice of supports for holding up the upper vagina. The direction of the intra-abdominal thrusts are also changed by removal of the cleavage planes and the narrowing of the upper vagina The steps of the hysterectomy are shown in Figs. 240–242. The broad ligaments and their extensions are *tied off with ligatures left long* to serve as tractors to put the stumps upon the stretch when they later are fixed into the vaginal angles The uterus, tubes and ovaries are now re-

moved (Figs 243 244) and all raw stumps are brought into the vagina so that they can be made extraperitoneal by fixation sutures. An incision is now made on the anterior vaginal wall parallel to its long axis to permit the exposure of the bladder

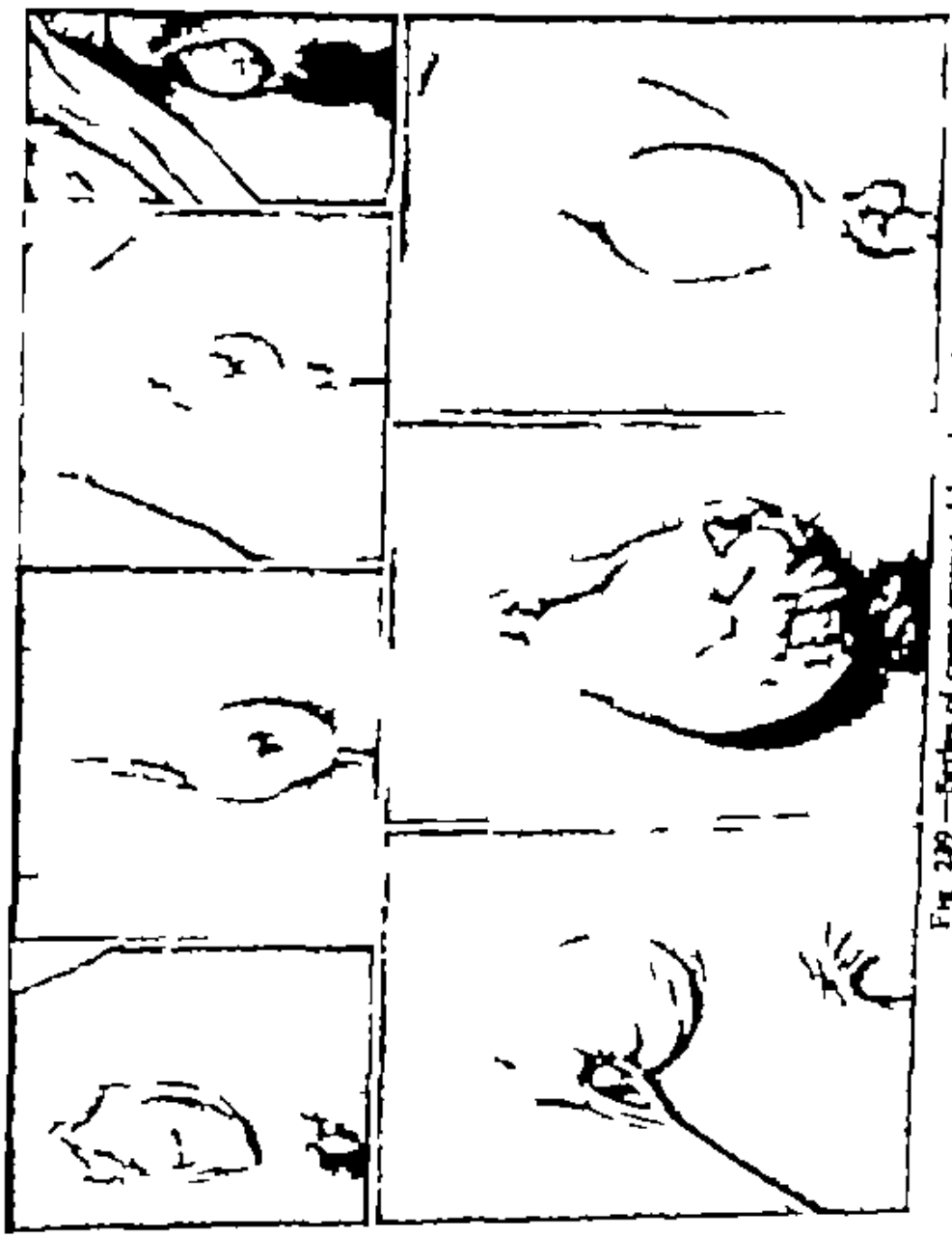

Fig 239—Series of cross sections of lay in wher

This is better done after the vaginal mucosa and fascia ha been separated from the bladder by dissecting scissor which re introduced closed and then are opened in the proper lines of cleavage. When the bladder has been freed the round ligament

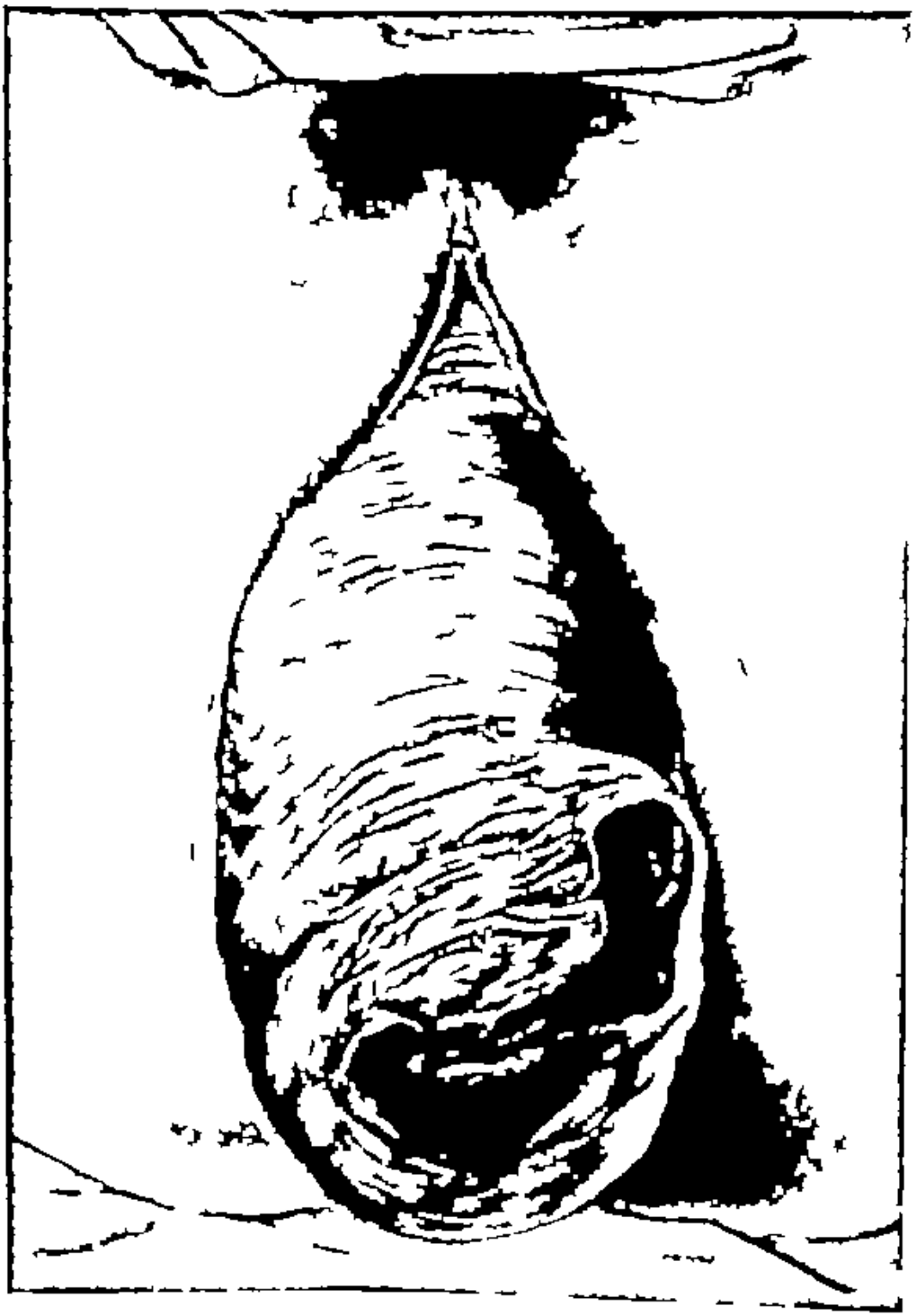

Fig. 240.—An extremely large prolapse with marked cystocele. The cervix is ulcerated from friction in locomotion.

is pulled down and attached to the anterior upper vaginal angle by a heavy chromic suture placed in the base of the broad liga

ment, and includes the bladder peritoneum the round ligament and adjacent broad ligament, and returns to the broad liga ment base for its support (Fig 245 A) This is repeated on the opposite side. The broad ligament stumps are now treated in

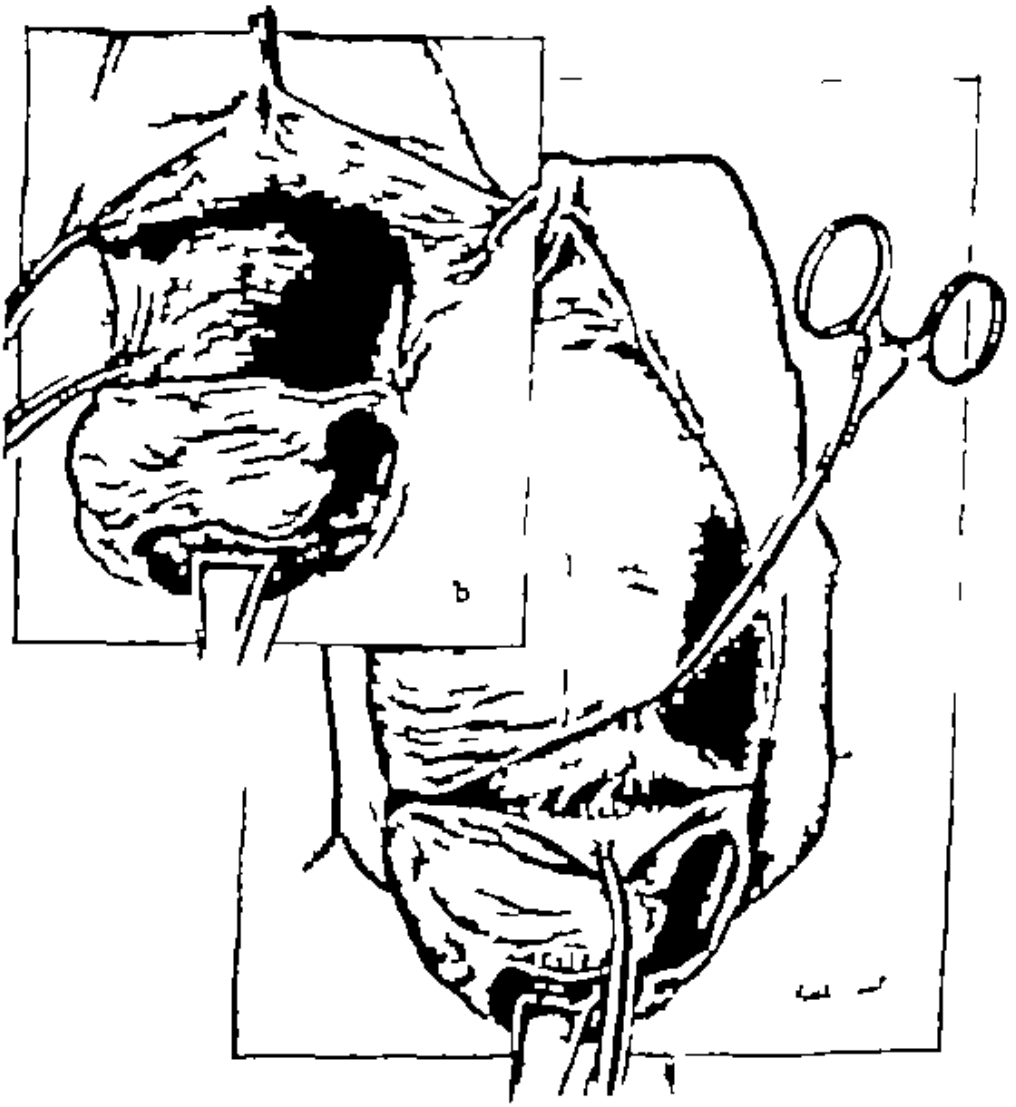

Fig 241 —a, The cervix is circumscribed and flap turned dow to cover the ulcer For artistic reasons it is not depicted b, he bladder is separated from the uterus

the same manner and are fixed int the ngles of the wound so that they will elevate that portion of the agina and support the base of the bladder The two stumps are now united medially to cut off the upper portion of the peritoneal opening and make a better support for the bladder and gi e a firm floor The

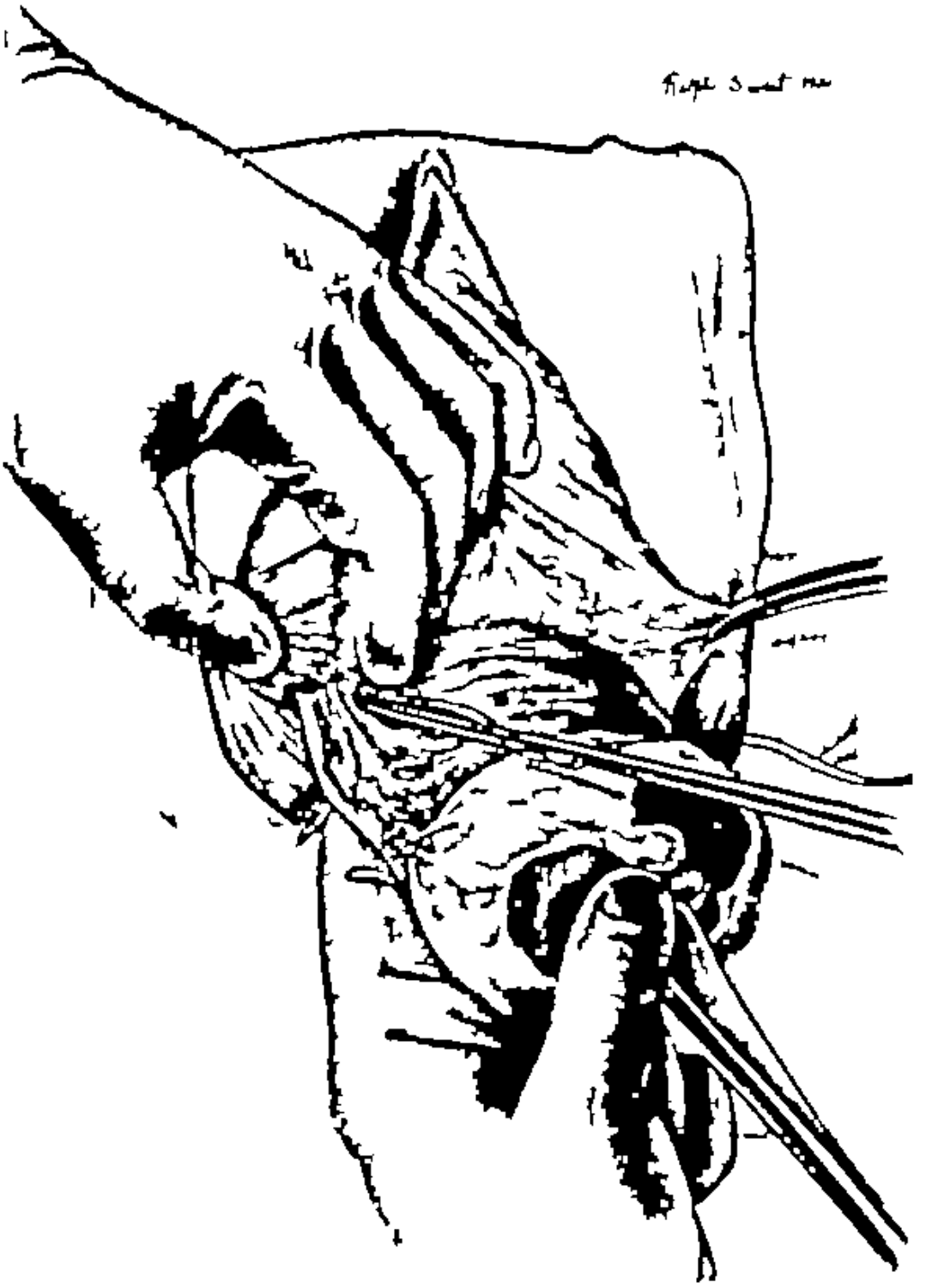

Fig. 242.—Ligation of the uterine vessels in broad ligament.

uterosacral ligaments, in turn, are brought down and fastened to each side of the vaginal incision immediately below the new attachment of the broad ligaments. They are also united

ment, and includes the bladder peritoneum the round ligament and adjacent broad ligament, and returns to the broad liga ment base for its support (Fig 245 A) This is repeated on the opposite side. The broad ligament stumps are now treated in

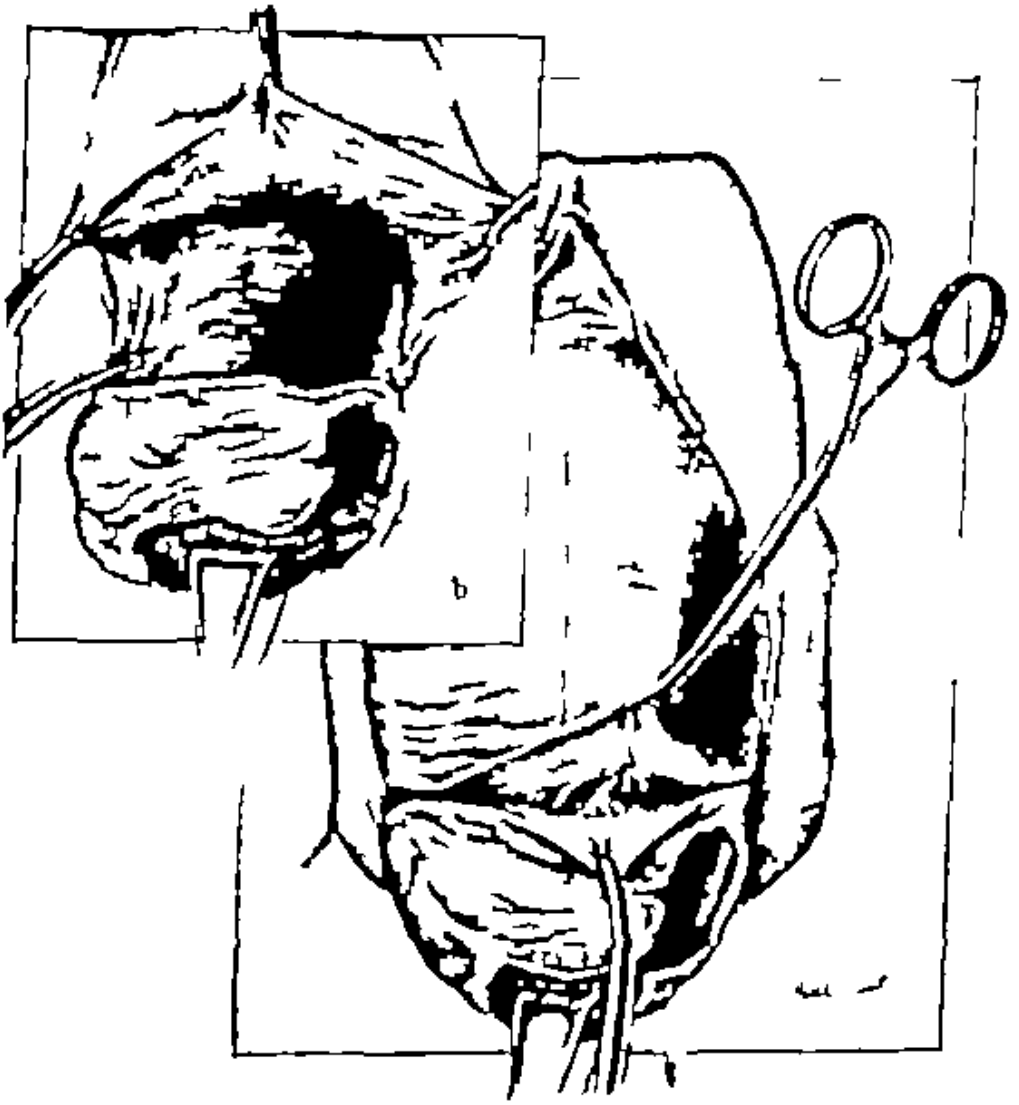

Fig. 241.—a, The cervix is circumscribed and flap turned down cover the ulcer For artistic reasons has not depicted b, the bladder is separated from the uterus

the same manner and are fixed into the angles of the wound so that they will elevate that portion of the agina and support the base of the bladder The two stumps re now united medially to cut off the upper portion of the peritoneal opening and make a better support for the bladder and give a firm floor The

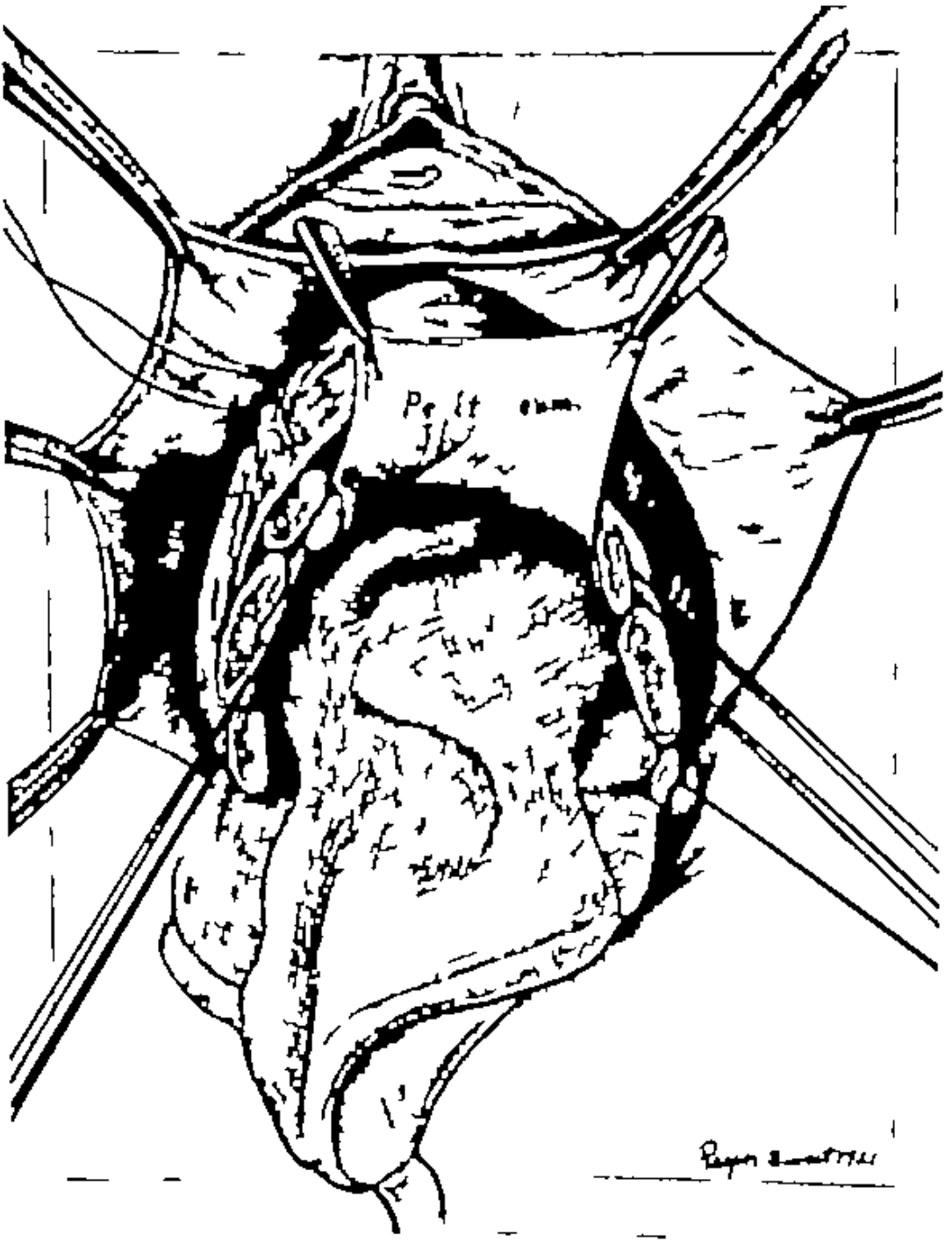

Fig. 244.—Showing the flaps left after the hysterectomy. A fixation suture has been laid through the peritoneum and round ligament to support the anterior upper angle of the new vagina. The broad ligament and utero-sacral stumps are depicted below. The bladder has been elevated and the fascial flaps are shown.

medially to close off the peritoneal cavity. The selection of proper points for the fixation of these stumps insures the success of the

Fig 243 —Tying off the right adnexa The uterus has been freed without inverting it, to lessen the chances of infection from the ulcer The ulcer has been covered by a flap of mucosa and several layers of gauze not depicted in the drawing

the fascia with a gauze sponge The excess flap is trimmed away to a desirable dimension, and the fascial margins are united by interrupted heavy chromic sutures. The sutures at the upper angle may also be passed into the newly united round and broad ligaments to obtain added support. After the union of the fascia the mucosa should be approximated by a continuous suture (Fig 245 B)

Time was when the cystocele constituted the problem of procidentia. This no longer holds true, although there are more procidentias which present cystoceles as their major complication than giant rectoceles. The success of a cystocele repair depends upon the preparation of the flaps The introduction of dissecting scissors has simplified the problem, since they prepare flaps in the simpler and most certain manner Flaps are essential for success in the operation. When cystocele constituted the problem, the fascia was not incised and the incision ran only through the mucosa, and there were no free flaps to serve as supports. With properly prepared flaps even an indifferent repair may now result successfully or at least approach 100 per cent. of its possibilities If the bladder is kept empty after operation, either by very frequent catheterization or better by the use of a self retaining catheter There is never any difficulty in obtaining a firm anterior vaginal wall in the narrower angles of the pubis, but the broad ligament region is not so easy to treat. For this reason the denudation area of the anterior vaginal wall should be triangular and its two lower angles should be firmly united with the two broad ligaments to serve as support for the bladder base Much has been written concerning the fascia of the anterior wall It hypertrophies to such an enormous extent in prolapse that it may no longer be considered firm. It suggests large muscles which are seldom strong Since the firmest margins are near the pubic bones, all excess tissue should be removed

Complete prolapse with marked rectocele are the very difficult cases to cure. Failures result when the surgeon leaves a capacious vagina. The nearer the pelvic floor is closed, the more certain is the cure in this especial group of cases. The bladder may be kept empty following operation but there is no way of

operation. The stumps retract in healing and further elevate the vault of the vagina.

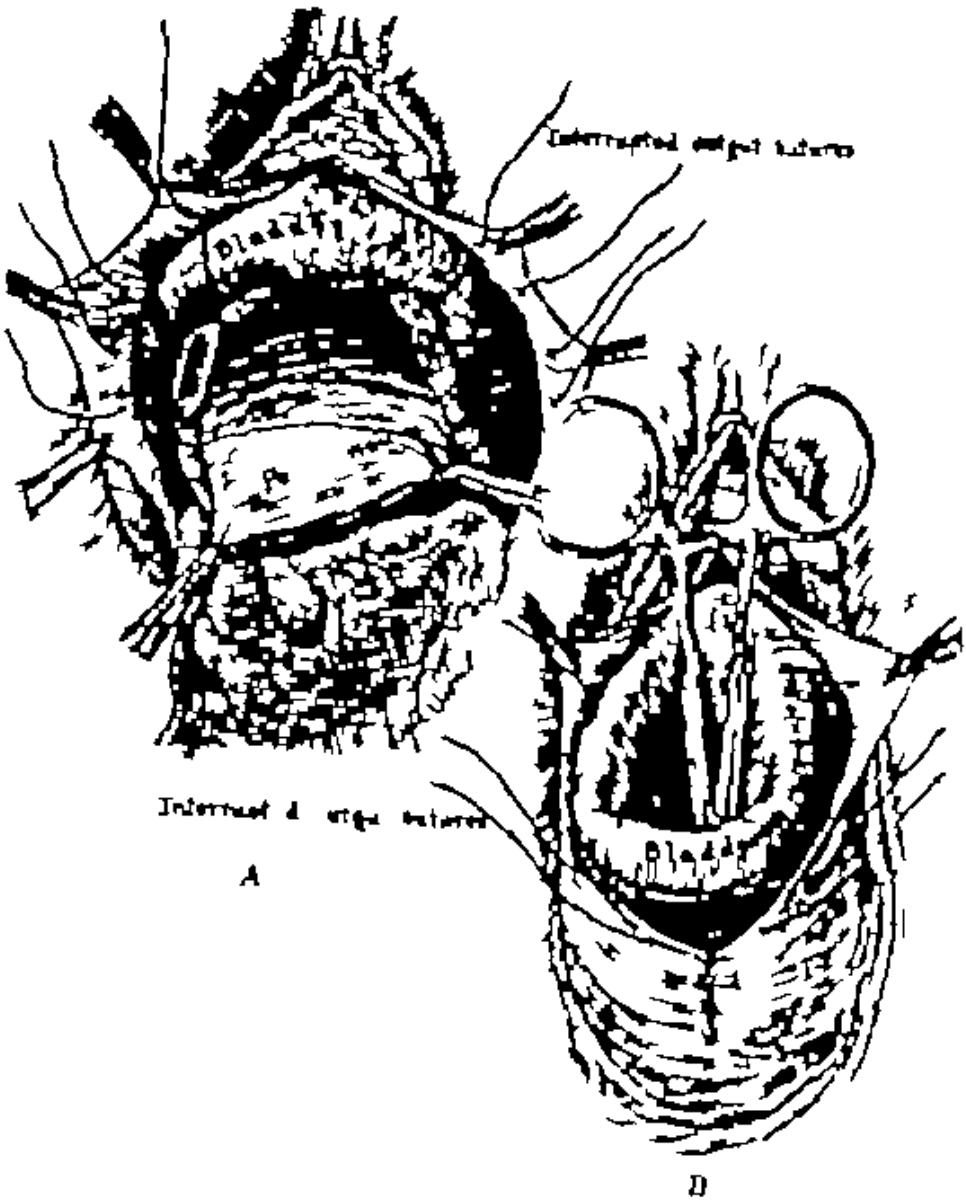


Fig 245.—*A* The round, broad, and uterosacral ligaments are united to the pelvic fascia and to each other thus elevating the bladder *B* The ligaments have been united to form support for the upper vagina and bladder The bladder is tucked in and the pelvic fascia is united, after which the anocom is brought together This redundancy unusual, but existed in this individual case

*The bladder is now freed from the anterior wall of the* gina This can be done by the dissecting scissors or by stripping back

countered. This region may present its own problem so the dissection may be momentarily discontinued. The mucosa should be removed so as to leave a vagina as small as is compatible with the social condition of the patient (Fig. 247). The uterosacral union is the bulwark of the posterior vaginal vault. Proceeding

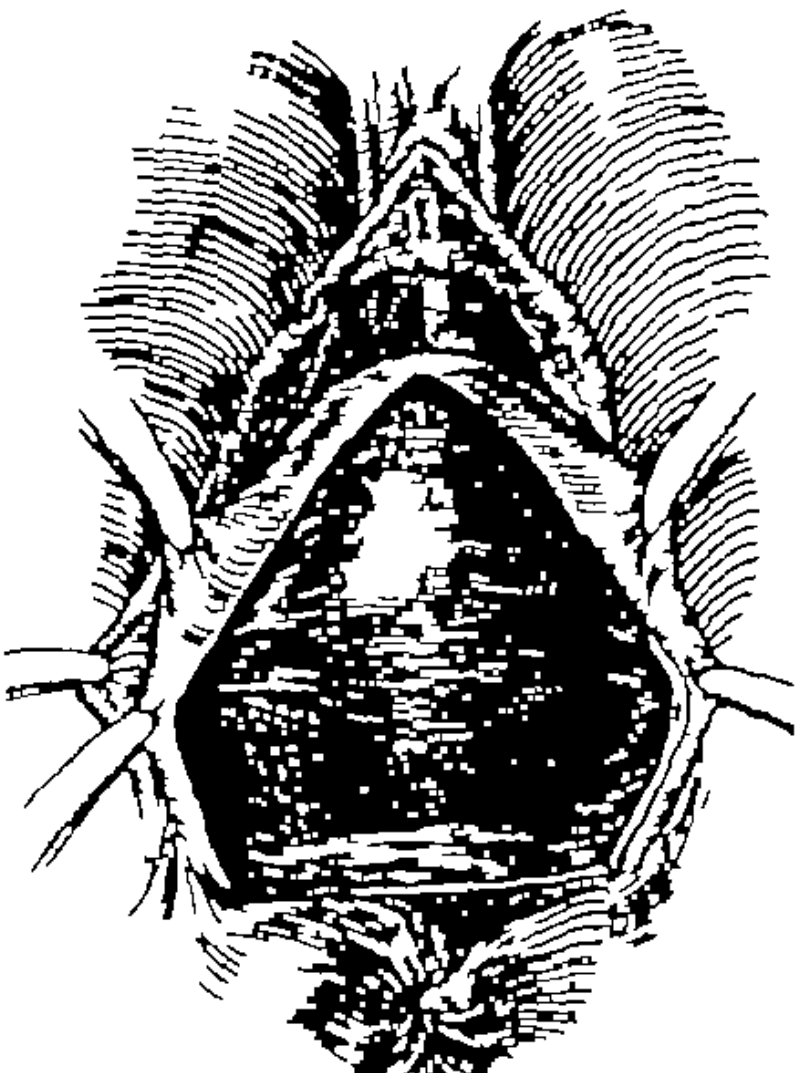

Fig. 247.—Exposure of the rectocele. Note the firm fascial and muscular flaps.

from here downward by typical rectopexy sutures, the rectum is elevated and closed off behind a firm fascial wall (Fig. 248). Our experience suggests a fascial support of at least two layers of interrupted sutures and the union of wide areas of free firm fascial flaps (Fig. 249). The mucosa is now united by a continuous suture (Fig. 250).

so treating the rectum. The closure must be made with the idea that feces are constantly pressing down and impinging upon the sutures, either to break them down or more likely to free them by necrosing their tissue supports. The rectum must be supported in a manner identical to that of the bladder but with more layers of support. Proper flaps are essential for firm union (Fig 246)

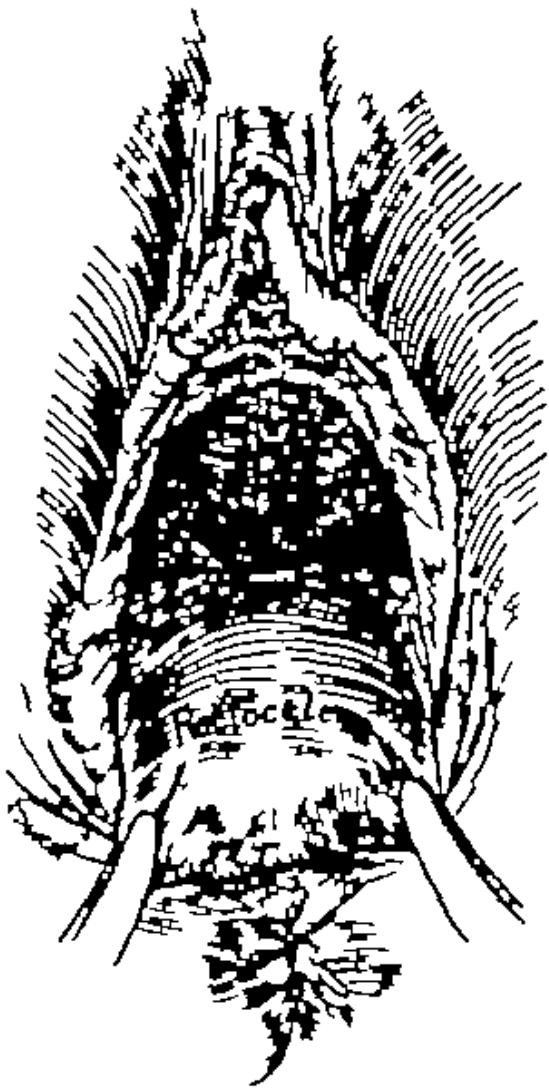

Fig 246.—The cystocele has been repaired Clamps drawn down the rectocele

The uterosacrals must be further united as a bulwark against the thrust through the pouch of Douglas. They should be closed as completely as seems safe and allow only sufficient clearance for a heavily distended rectum. The redundant posterior wall is then removed downward from above until the perineum is en-

deaths and no new cystoceles. One case was lost from the series. All others have been frequently examined The patient s statements have not been used as a basis to determine the anatomic condition.

There has been, however one return of rectocele which has been successfully reoperated. It was a case early in the series when the cystocele was believed of paramount importance

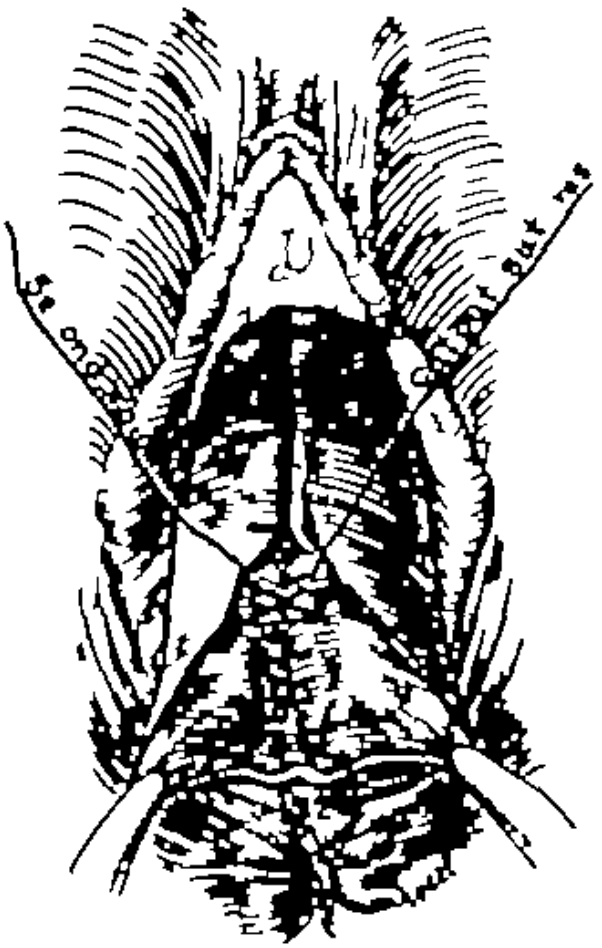

Fig 249 —Reinforcing the first layer of sutures to close off the rectocele.

This patient had a giant rectocele from which we learned much concerning the value of fully utilizing the uterosacral ligaments. The recurrence developed within the first year following operation.

One cannot fail to be impressed with the number of prolapse cases which apply for treatment after two three or even more unsuccessful operations. Every detail to secure success should

The perineum is now repaired after a very extensive dissection. The transverse profundis muscles are united to further displace the rectum and a large perineal body is built up by layers. It is of interest that the rectal sphincters of these cases always seem loose. The perineum must be built up to support

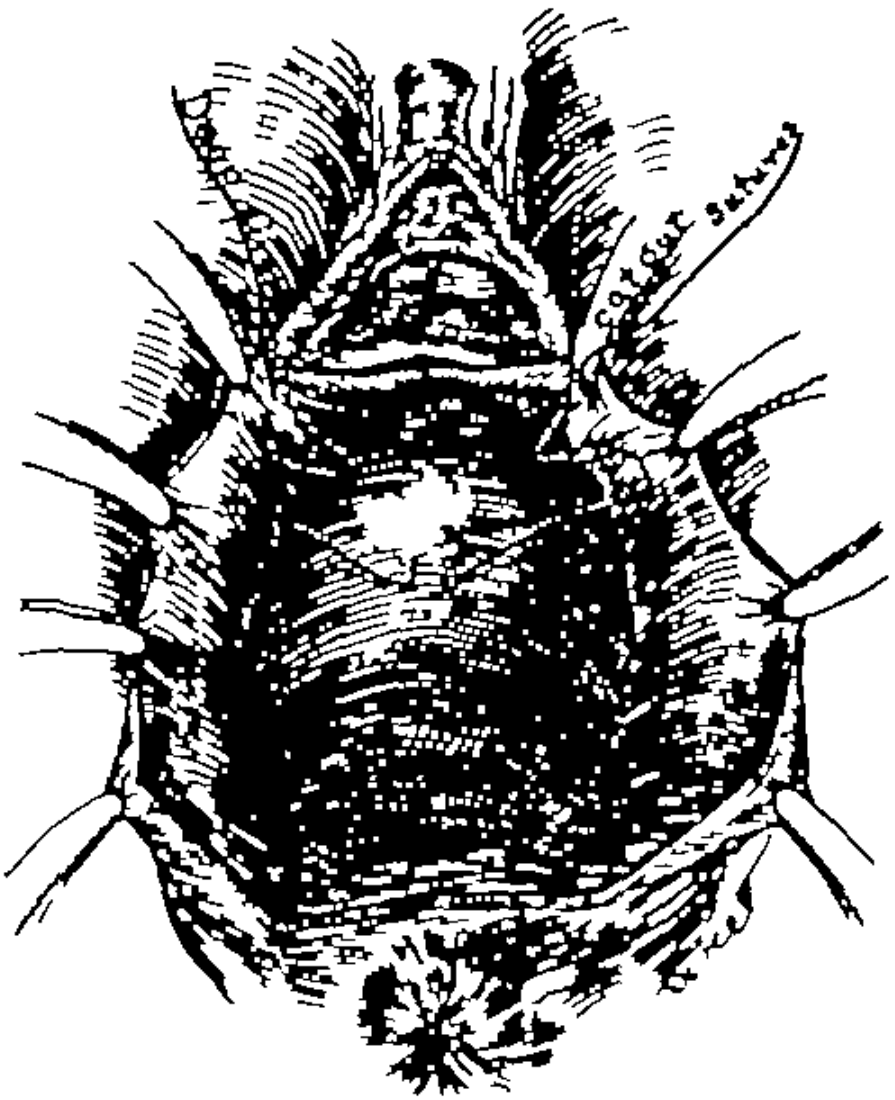

Fig 248.—Closure of the rectocele. Showing the first of series of sutures for rectopexy.

them. Occasionally it is necessary to bring even the edges of the gluteal muscles into the wound.

In our series of 52 complete procidentias all chiefly of the second and third segments we have had no complete recurrences during an interval of one to five years. There were no

deaths and no new cystoceles. One case was lost from the series. All others have been frequently examined. The patient's statements have not been used as a basis to determine the anatomic condition.

There has been, however one return of rectocele which has been successfully reoperated. It was a case early in the series when the cystocele was believed of paramount importance

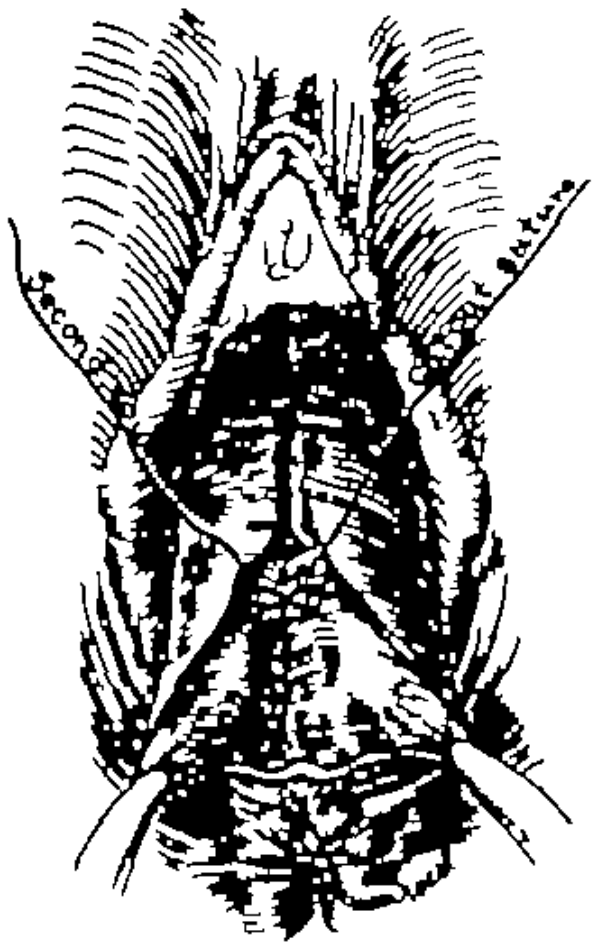

Fig. 249.—Reinforcing the first layer of sutures to close off the rectocele

This patient had a giant rectocele from which we learned much concerning the value of fully utilizing the uterosacral ligaments. The recurrence developed within the first year following operation.

One cannot fail to be impressed with the number of prolapse cases which apply for treatment after two three or even more unsuccessful operations. Every detail to secure success should

therefore be carefully considered. Cases should not be operated while bearing infected ulcers, nor while the urinary disturbances are based on infectious changes.

The postoperative care needs little discussion. The care of the bladder demands the greatest attention. Instillations of 1 ounce of 1 500 silver nitrate solution after catheterization keep

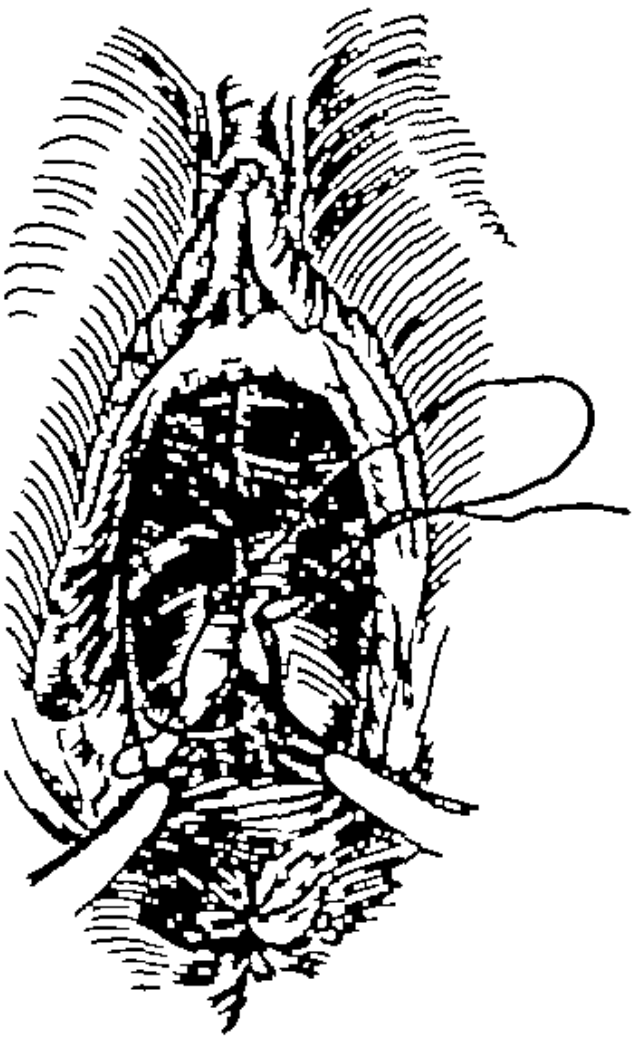

Fig 230.—Closure of the vaginal sources, by suture including apical fascia

down bladder infections. A rectal tube to allow the escape of gases should be left in after operation. The bowels are moved on the fifth day twelve hours following a large sweet oil injection. The patients are kept ten days in bed in the horizontal position.

We wish to emphasize the part played by the hysterectomy

Its chief function is to permit a proper exposure and allow for the shortening of the uterine supports for the elevation of the upper end of the vagina. A complete inversion of the vagina will follow a hysterectomy if the pelvic floor is not reconstructed. Upon the proper repair of the floor depends the success of the operation.

PROCIDENTIA RESULTS. AUTHOR'S METHOD

(52 cases)

| | |
|---|---|
| 1916 | 4 cases (results good unless otherwise noted) |
| Period of observation | |
| 1 to 1½ years | 3 cases |
| 3½ years | 1 case |
| 1917 | 5 cases |
| 6 months | 1 case |
| 1½ years | 2 cases |
| 3½ years | 1 case |
| 4 years | 1 case (return of rectocele. Reoperation January 1920 Good result year later) |
| 1918 | 17 cases |
| Lost | 1 case |
| 6 months | 1 case |
| 1 to 1½ years | 8 cases |
| 2 to 3 years | 5 cases |
| 3½ to 4 years | 2 cases |
| 1919 | 20 cases |
| 6 months to 1 year | 9 cases |
| 1 t 2 years | 4 cases |
| 2 t 3 years | 7 cases |
| 1920 | 1 case |
| 1 year | 1 case |
| 1921 | 5 cases (of one year' standing). |
| 1 year | 5 cases. |

AGES IN 52 PROCIDENTIA CASES

| Years | Cases |
|---|---|
| 30 to 40 | 6 |
| 40 to 45 | 12 |
| 45 to 50 | 10 |
| 50 to 55 | 6 |
| 55 to 60 | 8 |
| 60 to 65 | 7 |
| 65 to 70 | 2 |
| 72 | 1 |
| | 52 |

## CHORIO-EPITHELIOMA AND ITS TREATMENT

Singer in 1889 described his first case of chorio-epithelioma less than 700 cases of this rare tumor have been described. There is no doubt, however but that the growth is more common than is indicated by these figures. There are 2 unreported recent cases in this city No cases were reported from Continental Europe during the war and it is a matter of interest that nearly all the reported cases were observed in Europe.

Yet there is really little known concerning this extremely interesting tumor and in spite of the very considerable literature that has developed gradually even many basic facts concerning the growth are still unsolved. For this reason reports even of well-controlled single cases are warranted if they present unusual features.

Chorio-epithelioma are composed of two chief types of cells which present the characteristics of the syncytium and Langhans cells of the chorionic fetal epithelium. They arise nearly always shortly following a pregnancy usually metastasize through the blood vessels early and kill with astonishing rapidity The primary growth develops almost invariably in the uterine cavity either in the placenta or in the uterine wall occasionally in the tube following a tubal pregnancy and very rarely in the ovary

Students are not yet absolutely agreed that all chorio-epithelioma owe their rigin to a pregnancy While there appears no reasonable doubt that the very great majority of cases do so there is considerable question in the smaller number The interval between the pregnancy and the appearance of the tumor is usually quite short, yet occasionally there is a latent period which may amount to years. There are moreover a few cases in which the disease occurred in women who have

never been pregnant, and in a very few cases the tumor has been found in virgins. Both groups of cases usually presented tumors which apparently were primary in the ovary

There is always the possibility that chorio-epithelioma which, in any but the virgin cases were primary in the ovary followed ovarian pregnancy in spite of the extreme rarity of such an event. It seems more likely however that there was no relation to pregnancy in either group of cases. The question of the origin of these tumors in these groups of cases is of the greatest interest. There is strong evidence that they may arise from ovarian teratoma. There is no doubt that areas of teratomata of the sex glands may be indistinguishable from uterine chorio-epithelioma.

Testicular growths resembling chorionic villi have been described in the literature at irregular intervals since Waldeyer first drew attention to this phenomenon in 1868. Some cases, as the one described by Breus in 1878 presented polypoid masses extending to the heart. Many authors of the French school notably Malassez and Monod, Carnot and Marie and others, have called attention to the regularity with which these processes develop in the blood-vessels. Yet it remained for Wilmow and Schlagenhaufer to emphasize the resemblance of certain of these testicular tumors to chorio-epithelioma. Their case presented a teratoma of the testicle which had given off generalized metastases which were carried by the blood. It was composed of syncytium and Langhans cells and contained structures which resembled chorionic villi. The observers traced the origin of the syncytium to the epithelium of the tumor demonstrated glycogen in Langhans cells, proved the hemorrhagic character of the metastases and showed that this chorioma of the testicle although of teratomatous origin, reproduced almost exactly the essential features of uterine chorio-epithelioma.

When the excitement following this discovery died down it developed that similar processes could occur in the ovary although such cases were few in numbe in comparison with the testicular choriomas Pick a case in the ovary reproduced the gross picture and microscopic details of terine horioma It

contained however a sarcomatous framework in addition to the syncytial and Langhans cell derivatives. The syncytial masses developed from the neuro-epithelial cell group of the teratoma and Langhans cells contained glycogen. Other cases have been reported in which the other teratomatous features were less marked, and Ries, when presenting his case in 1915 was able to collect from the literature 6 cases of primary chorioma of the ovary which presented no other evidence of teratomatous structures than the chorio-epitheliomatous areas.

A number of theories have been advanced to explain the origin of the syncytial and Langhans cell elements in the teratomata resembling uterine chorio-epithelioma which have been found in sex glands The first assumed that fetal membranes had been included in the teratoma and that they proliferated only after remaining dormant for many years. This view failed because no teratoma has yet been described which presented such structures. The theory of Risel, that the tumor may develop from undifferentiated fetal ectoderm contained in the teratomata has been confirmed by several observers. The fact that most uterine chorio-epithelioma appear to arise from differentiated fetal cells need not controvert this theory Chorio-epithelioma may follow either early or full-term pregnancy as is shown by the compilation of Pollasson and Violet, but in either event the tumor appears to develop from highly differentiated epithelium. In 455 collected chorio-epithelioma these authors found that 45 per cent. (203 cases) followed hydatidiform mole 30 per cent (135 cases) followed abortion 2.5 per cent (12 cases) followed ectopic pregnancy and 21 per cent. (99 cases) followed labor at term. The character of the previous pregnancy could not be determined in the remaining 1 5 pe cent. (6 cases) If the tumor develops from the fetal ectoderm of the chorionic villi, it must arise from highly differentiated epithelium The case holds true if it arises from cells deported from the villi into maternal tissue, since these early become differentiated presumably from contact with the blood. If however the tumor springs from remnants of trophoblasts on the maternal side of anchoring villi (anchoring nodes) or the

trophoblastic cells on the fetal side of the Nitabuch line, the subject is less clear since these cells may well be undifferentiated fetal ectoderm. It is more difficult to explain why the chorioma of the ovary if arising from teratoma, presents no other evidence of teratomatous features.

There is also the slight possibility that *certain of the* chorioma which appear as primary in the ovary are not what they appear to be but in reality are metastases from sarcoma or carcinoma which have developed an atypic structure. Such cases should not confuse however since they can be diagnosed readily by careful study of a number of different sections, because the structures suggesting chorioma which develop in metastases from carcinoma or sarcoma are not uniform in appearance and resemble chorio-epithelioma in comparatively few areas.

We have recently observed the following case which presents several unusual features on account of which it seems *worthy of record*

Case L—Widowed Mexican, aged fifty-two years entered the University of California Hospital October 19 1921 complaining of irregular uterine bleeding of two months duration. She is acquainted only with the family history of her father mother and children. This is negative for tuberculosis insanity and cancer She has never had serious sickness. Her menstruation began at twelve years was regular of twenty-eight-day type had a duration of four to five days. The menopause came on at the age of forty nine nearly four years ago. She was married at fourteen and has had 15 children and no miscarriages between her fifteenth and thirty-seventh year or 15 children in twenty two years. *All pregnancies* and labors were normal. There were no instrumental deliveries or breech extractions. On careful questioning she states that she bled a few weeks after the birth of 3 children and was cureted but was confined to bed only for day or two She had some hemorrhage after her last child which was born fifteen years ago. Save for occasional trouble with hemorrhoids the rest of her personal history is not of interest.

About one year before the menopause or a little more than four years ago she had a uterine hemorrhage which came on without warning soaked quite a number of cloths and stopped after medicine and injections. She was in bed only a few days Menstruation up to that time had been perfectly regular There was no further bleeding until two months ago when a blood-tinged stain gradually developed, until on some days there was sufficient blood to heavily stain an entire pad. During the period of bleeding there was no pain. Pain marked the cessation of bleeding It was present in the lower left abdominal quadrant. Aside from occasional pain on urinating there were no other complaints.

The patient was extremely stout. The physical examination was negative. On vaginal examination, the vagina was relaxed and a small polyp was seen at the external os. The cervix was short and thick. The uterine contour was normal the organ was upright and moved with slight difficulty and was enlarged to twice normal size. The adnexa were free There were no masses

Feeling that the bleeding was probably due to a uterine polyp the uterine cavity was explored with a curet forceps, and a considerable amount of old blood together with a small mass felt to be a necrotic polyp was removed. At the same time the cervical polyp was cut away with a broad base and the vaginal vault was repaired. There was very little tissue in the scrapings. The mass considered a polyp was necrotic and gave no definite picture A few areas on the slides strongly suggested chorio-epithelioma, but there was not enough tissue to make the definite diagnosis. The bleeding did not cease following the curetage, but was present daily at least as a stain. The patient was extremely stout and had a tremendous abdomen. Accordingly radium treatment was determined upon as a matter of choice and two tubes of radium emanations containing 55 mc. and 87.5 mc respectively were introduced tandem int the uterine cavity at another sitting ten days later They were screened with 0.5 mm silver 1 2 mm brass 2 mm rubber each capsule measuring 3½ cm. and were left

in place for twenty-four and a fraction hours to give a total dosage of 3420 mc. hours. She left the hospital five days later

Forty-six days after the radium treatment she returned, stating there had been no more bleeding until three days before, when she had a severe uterine hemorrhage which came on without pain. We, therefore urged operation and on January 11 1922 the uterus, tubes and ovaries were removed by an ordinary abdominal panhysterectomy without a preliminary curetting

The operation was difficult on account of the great thickness of the abdominal fat. The uterus felt brawny Its contour was even. The broad ligaments contained no local indurations, although they were firmer than normal. The parametria and uterosacral ligaments were brawny This we attributed at least in part to the radium treatment. There was no evidence of pelvic or abdominal metastases. The upper abdomen was negative Preliminary t the operation the chest was negative The lungs appeared normal on physical examination. An x ray plate was not taken, as there was no cough or lung symptoms. There were no external tumors.

The specimen consists of uterus cervix tubes, ovaries and upper broad ligament

In the laboratory the uterus measured 9 5 cm long 8 cm. wide and 6 cm. thick. The uterine walls were thick, measuring 3 to 4 cm. There is a definite uterine cavity present Projecting into it in the right upper portion near the opening of the tube is an irregular polypoid mass measuring 1 5 by 1 by 1 cm. This is extremely friable and cellular in appearance (Fig 251) It is stained with blood. Immediately below this polypoid mass is a small excavation about 5 mm in depth This is lined by a smooth yellow membrane somewhat granular at its base. It suggests pyogenic membrane appearance The remainder of the uterine cavity is lined by what appears to be normal endometrium bout 1 mm in thickness except t a point just opposit the polypoid growth previously described Here the endometrium juts out as small polypoid projections extending into the uterine cavity

Extending back from the polypoid mass are outgrowths running back in the uterine wall for at least 2.5 cm. About 5 mm. farther out is a well circumscribed hemorrhagic nodule 7 to 8 mm in diameter The outer border of the nodule is less than 5 mm. from the peritoneal surface of the uterus. The whole uterine wall is mottled by patches of rust-colored pigment apparently changed blood which appears independent of any gross extensions from the microscop c tumor

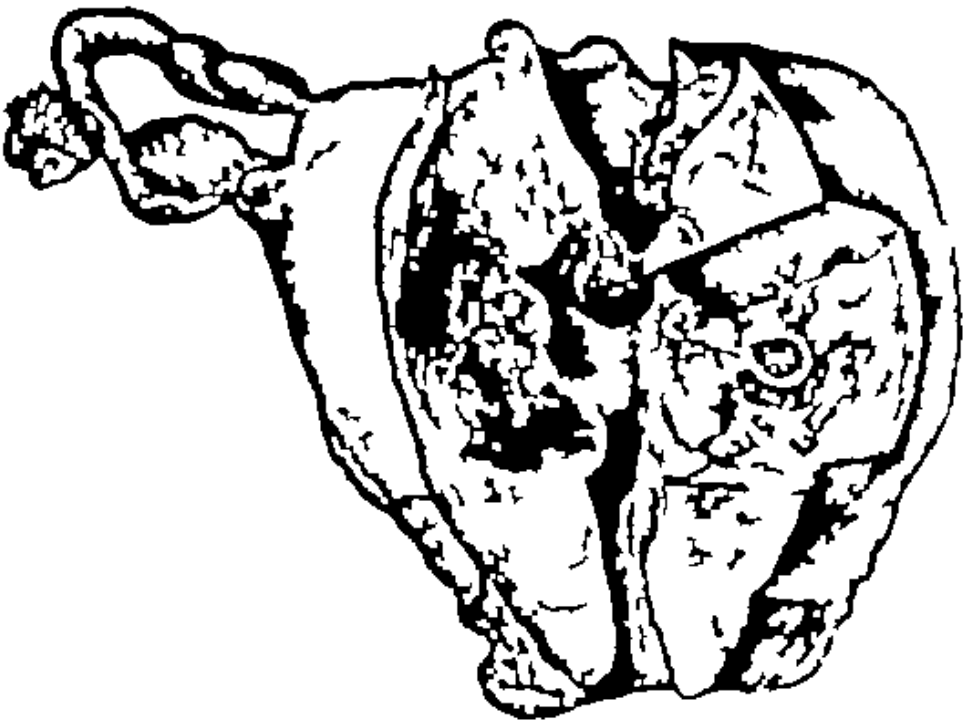

Fig 251.—Chorio-epithelioma. Uterus with polypoid mass projecting from fundus. Hemorrhagic nodule and invasion of uterine wall well shown.

The walls f the cervix are hypertrophied, but are otherwise normal The cervical mucosa is normal in appearance and shows no reddening or cyst formation.

The right tube measures 9 cm in length It is somewhat con oluted nd is very slightly thickened. There are three or four perit neal inclusions 2 to 3 mm. in diameter near the fimbriated end The fimbriated extremity is open but the fimbria re somewhat blunted

The right ovary is 4.5 by 2 cm by 5 mm. in size It appears

in place for twenty four and a fraction hours, to give a total dosage of 3420 mc. hours. She left the hospital five days later

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The operation was difficult on account of the great thickness of the abdominal fat. The uterus felt brawny Its contour was even. The broad ligaments contained no local indurations, although they were firmer than normal The parametria and uterosacral ligaments were brawny This we attributed at least in part to the radium treatment. There was no evidence of pelvic or abdominal metastases. The upper abdomen was negative. Preliminary to the operation the chest was negative The lungs appeared normal on physical examination An x-ray plate was not taken as there was no cough or lung symptoms. There were no external tumors

The specimen consists of uterus, cervix, tubes ovaries, and upper broad ligament,

In the laboratory the uterus measured 9 5 cm long, 8 cm wide, and 6 cm. thick. The uterine walls were thick measuring 3 to 4 cm. There is a definite uterine cavity present. Projecting into it in the right upper portion near the opening of the tube is an irregular polypoid mass measuring 1.5 by 1 by 1 cm. This is extremely friable and cellular in appearance (Fig 251) It is tained with blood Immediately below this polypoid mass is a small excavation about 5 mm in depth This is lined by a smooth yellow membrane somewhat granular at its base It suggests a pyogenic membrane in appearance The remainder of the uterine cavity is lined by what appears to be normal endometrium about 1 mm in thickness except at a point just opposite the polypoid growth previously described. Here the endometrium juts out as small polypoid projections extending into the uterine cavity

Gross diagnosis Chorio-epithelioma uteri senile tubes senile ovaries.

On microscopic examination the tissue was found to consist of irregular masses of cells of two distinct types (Fig 252) The one presented an irregular darkly staining fusing protoplasm with large granular nuclei scattered throughout the protoplasm These did not have a definite cell boundary a characteristic feature of the syncytial cells. The other cell, identified as Langhans layer consisted of epithelial cells with well-marked cell membrane and a faintly staining vesicular

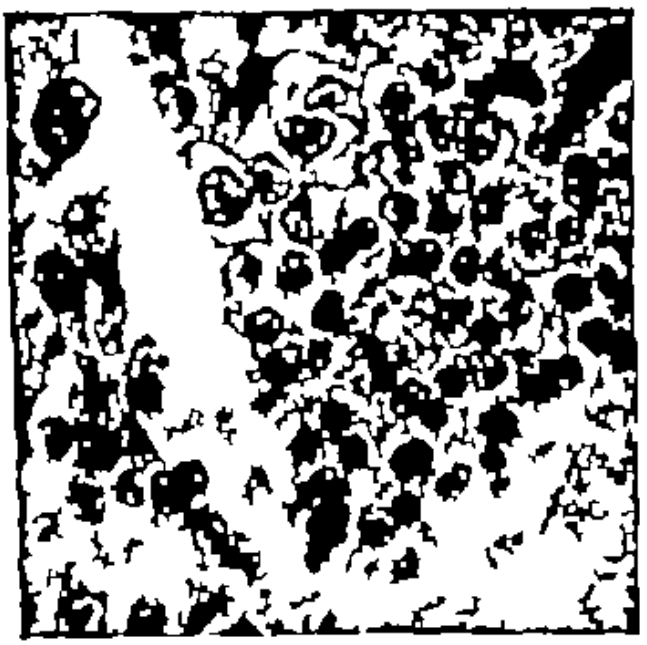

Fig 253.—Chorio-epithelioma Microphotograph showing Langhans cells with mitotic figures

nucleus (Fig 253) Frequent mitotic figures were noted throughout the section and the various cells were in intimate contact with enlarged blood-spaces. The blood-vessel walls were frequently lined by masses of syncytial cells. There were extensive extravasations of blood on all sections of the tumor There were no villi seen and no evidences of degeneration of these structures (Fig 254)

The case therefore is a chorio-epithelioma in a woman of fifty two years who developed symptoms four years after the menopause and fifteen years after her last pregnancy She

has had fifteen full term pregnancies and no abortions. She bled in the puerperium of three pregnancies and had one hemorrhage a year before the menopause. Careful questioning could

Fig. 254.—Chorio-epithelioma. Groups of Langhans' cells in center with syncytial element on periphery of section.

not develop history of abortion. This long latency is very unusual. Yet there is one case in the literature in which the period elapsing between the last pregnancy and the development of the disease is much longer (thirty-one years, case of

Palthauf and Pollosson) The interval is often from three to four years Caturani reported a case with a five year interval Polano one of ten years. While there is always a possibility that an early abortion has been overlooked in the cases with long latent periods there are several incontrovertible cases in the literature which prove that chorio-epithelioma may not develop until many years after a pregnancy Krösing s case is the best example of this group His patient was fifty two years of age. Five and a half years before the patient had a hydatidi form mole which was removed from the uterus. Both ovaries were removed two and a half years later at which time the uterus appeared perfectly normal. Following this operation she went into the menopause Bleeding returned five and a half years after the hydatidiform mole and three and a quarter years after the ovariotomy and was found to be due to a chorio-epithelioma. Her case report is accompanied by a table of 21 examples of a long latent period.

The observation of Ries suggests that a villus may preserve its identity in the uterus for many years. While his study unfortunately is based upon a case which is unique in the literature the observation is well controlled In a uterus which he removed for fibroids from a woman who had not been pregnant for eighteen years he noted a long thread like formation extending down several inches from its attachment in the blood sinuses of the left uterine horn. He convinced himself that these filaments were chorionic villi, the epithelial layers of which had not proliferated and had not, therefore, developed into chorio-epithelioma.

It is a matter of interest that in our case there were no evidences of metastases recognizable at time of operation or now three months later in spite of the fact that the case presents as typical chorio-epithelioma of Marchand and a chorio-carcinoma of Ewing In discussing its origin it seems most likely that the tumor developed on the basis of a pregnancy since its presence in the uterine cavity excludes a teratoma The growth is so characteristic of chorio-epithelioma that it could not be the degenerations of an adenocarcinoma.

The prognosis of chorio-epithelioma is of the very greatest interest. While as a group this tumor is the most malignant neoplasm known, and death usually follows in from a few weeks to a year there are a few cases of spontaneous recovery and a few examples of a semibenign type which have disappeared following irritations, such as curetting or an incomplete removal procedures which would stimulate an ordinary cancer to its fullest activity Quite naturally these exceptional cases have been the subject of much study These good results cannot be expected with confidence, however since the tumor often kills by metastases even before the primary growth has given symptoms. Occasionally the primary focus is not apparent even after careful autopsy as in the case of Williams. This warrants the belief that the primary growth may lie in the placenta and be extruded at labor Metastases are widely disseminated and may occur in any portion of the body although they are more frequently noted in the apices and bases of the lungs which are more commonly involved than the middle lobes. Next to the lungs the vagina and vulva are most commonly involved by metastases.

Yet neither cases presenting pulmonary or vaginal metastases are necessarily fatal. Von Fleischmann in 1905 collected cases which Chrobak, von Franque Zagerjunski, Kissel Ladinski, Neumann, Schauta and Pestalozzi respectively believed had recovered after metastases in the lungs All these cases had lung symptoms and signs apparent on physical examination. Recently there are one or two cases in which lung involvement was suspected from the x ray picture which also recovered spontaneously Teacher Risel Eden, and Lockyer have noted healed nodules in the lungs surrounded by others which were still growing in cases which terminated fatally While these observations are authentic it is not necessary however to state that such lucky cases are extremely infrequent and that the very great majority of cases presenting lung involvement speedily succumb.

There are a larger number of cases in which recovery has occurred after the development of vaginal metastases.

Schmauch early collected 13 examples Neumann and Kolomenkin later reported 2 cases and others more recently have presented single cases The observation of Rockafellow is the most remarkable of them In some of the cases reported the vaginal nodules were removed immediately after hysterectomy In others only the uterus was removed while neither the uterus nor vaginal nodules were completely removed in the cases of von Fleischmann, Hermann, and Kolomenkin. The uterus was removed in Rockafellow's case shortly following which large metastases, some as large as a kidney developed in the labia These when excised returned in a few weeks and in turn, were removed. They returned again. After four operations for recurrences the patient's condition was so bad that it did not seem worth while to again attempt removal To everyone's surprise the unoperated growth began to shrink, and disappeared spontaneously in a few weeks. The patient soon improved and regained good health and remained well for more more than two years while under observation.

Men have long interested themselves in classifications hoping to determine the malignancy of individual tumors Teacher arranged his 188 cases to show the relation of the mortality to the type of pregnancy which antedated the tumor 72 cases following a hydatidiform mole, with a mortality of 53 4 per cent. 59 cases following abortion, with a mortality of 66 1 per cent. 49 cases following labor at term had mortality of 89 6 per cent. There were 7 ectopic chorionmas in the series in which no tumor could be found in the uterus and in which the primary growth appeared to be in the tube or ovary Only one of these recovered Recurrences developed within six months after operation, or not at all except in 5 cases one of which (Löhlein) did not develop for one year

Many observers have attempted to correlate the degree of malignancy with the clinical findings and the histology of the tumor and determine a treatment based on the malignancy of the individual tumor Their results have not proved of much value however nor have greatly improved upon the work of von Veits and Schmauch who emphasized the great malig

nancy of tumors presenting mitoses in Langhans cells and showed that the tumors composed chiefly of syncytium were not so likely to be as virulent. The classification of Ewing is quite elaborate It also is developed on the histologic basis. Former authors worked out their theories for tumors classed according to Marchand's grouping of typical and atypical chorio-epithelioma. Ewing, however divided the typical chorio-epithelioma of Marchand into two classes (*a*) benign chorio-adenoma (*b*) the very malignant choriocarcinoma. The former growth was previously known as malignant placental polyp. This atypically reproduces the structure of villi and tends to remain for considerable periods within the uterine body Eventually they infiltrate the sinuses, invade the broad ligament and pelvic veins with villi, and kill but do not appear to uniformly give rise to wide-spread metastases. While malignant, the process is not as rapid as choriocarcinoma. There may be long latent periods between the appearance of symptoms and metastases. The malignant choriocarcinoma, however presents a very different picture. Its activity depends upon an extensive proliferation and pronounced metaplasia of both Langhans cells and syncytium The primary tumor in the uterus is comparatively small and does not enlarge that organ nearly as much as chorio-adenoma yet it metastasizes widely at a much earlier period. *Ewing divides the atypical chorio-epithelioma* of Marchand into syncytial endometritis and syncytioma which differ from each other chiefly in degree since both remain long localized as a uterine condition The lesion of the former is more endometritic while the latter presents as bulky mass which distends the cavity and enlarges the organ. Ewing argued that cures might readily follow in the syncytioma groups whereas they might not reasonably be expected in the choriocarcinoma. Ewing' hope has not been realized, since subsequent investigators have shown there are too many transitional cases between the various groups to permit the study to be of practical value E en in Schmauch's compilation many years ago there were many deaths in cases

in which syncytial cells were the predominating feature and in which Langhans cells were deficient or absent.

The various attempts at classification of the tumors in a manner to standardize treatment developed because of the confusing clinical course of the disease. Many authors refused to perform hysterectomy on the ground that it was unnecessary in the many cases in which there was no uterine tumor and useless in the cases which presented general metastases, statements which we feel we have proved may be fallacious. They called attention to the fact that cases might be cured by curetage and urged this plan of treatment, aiming to perform hysterectomy only when curetage failed to cure. The basis for this treatment was the belief that the tumor metastasized so early that the removal of the uterus would not improve the situation. Others were guided by false ideas of conservatism. The study of many cases which, although abandoned to their fate recovered either spontaneously without operation or lived after incomplete operations have proved the fallacy of this type of treatment.

From the standpoint of a surgeon it seems the sheerest folly to temporize with a tumor which belongs to the most malignant type of neoplasms, especially if there is chance of cure through hysterectomy. The problem of cure in chorio-epithelioma is strikingly similar to that of cervical carcinoma in that there is certainty of curing only the very earliest growths. It differs however in that late growths are occasionally cured by hysterectomy in chorio-epithelioma whereas none are cured in cervical cancers. The method of delay attempting first to treat by curetage and to remove the uterus in event the symptoms persist, no longer has a proper basis. Until more is known concerning this tumor we believe a surgeon who refuses to perform hysterectomy if there is a uterine chorio-epithelioma is accepting a responsibility which no surgeon should assume.

Within the last few years radium has entered the field of treatment, and although an insufficient number of cases have been reported to permit actual conclusions, it has appeared as logical treatment on purely theoretic consideration. Our case

may force a revision of opinion. Clark in 1921 reported 2 cases which were still alive between six and seven years. There are also a few cases noted in German literature. The case of Erck and Outerbridge has been quoted erroneously as a cure. It was treated with radium for a recurrence causing hemorrhage developing six weeks after a supravaginal hysterectomy The fact that this patient was subjectively well one month later is not of interest, since there is no later report of the case. Theoretically there may be trauma attending the insertion of the capsule of radium into the uterine cavity It is of interest, therefore, that our case did not respond to a fairly large dose of radium and that six weeks later there was no evidence of destruction of cells. On the contrary the disease was progressing extremely rapidly in spite of the fact that 142.5 mc had been left more than twenty four hours in the cavity giving a dosage of 3420 mc. hours.